SOCIAL, PSYCHOLOGICAL AND BEHAVIORAL RISK FACTORS OF OBESITY IN ADOLESCENTS IN VELLORE

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CERTIFICATE

This is to certify that "**Social, psychological and behavioral risk factors of obesity in adolescents in Vellore"** is a bonafide work of Dr. Divya V S, in partial fulfillment of the requirements for the M.D Community Medicine (Branch XV) of the Tamil Nadu Dr. M.G.R. Medical University to be held in 2015.

Guide

Dr. Jacob John, MD, M.P.H

Professor,

Community Health Department,

Christian Medical College, Vellore.

Head of the Department

Dr. Jasmin Helan Prasad, MD, DNB,

Professor and Head,

Community Health Department,

Christian Medical College, Vellore.

ORIGINALITY CERTIFICATE

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But He said to me ,"My grace is sufficient for you , for my power is made perfect in weakness"- 2 cor 12:9

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ACRONYMS

BMI	Body mass index
NCD	Non- communicable disease
GDP	Gross Domestic Product
CDC	Centre for Disease Control & prevention
IOTF	International obesity task force
WHO	World Health Organization
CI	Confidence Interval
SES	Socio Economic Status
ATS	Active Travel to School
PA	Physical Activity
TADS	Treatment of Adolescent Depression Study
NHANES	National Health and Nutrition Examination Survey
DEXA	Dual-energy X-ray Absorptiometer
MRI	Magnetic Resonance Imaging
CT	Computed Tomography
DASS	Depression Anxiety Stress Scale

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Abstract

Title : An assessment of Social, Psychological and Behavioral risk factors of obesity among adolescents who are attending schools Vellore

Department : Community Health Department

Name of the candidate : Divya V.S

Degree and Subject : MD community medicine

Name of the Guide : Dr.Jacob John

Objective: To determine the Social ,psychological and behavioral risk factors of obesity in adolescents studying in schools of Vellore

Methods : This community based case-control study . The study was powered to detect three times greater odds of being depressed among those who are obese as compared those who are non obese using a two sided fisher's exact test .The sample size calculated for case-control study was 63 cases and 123 controls. In order to identify the requisite number of cases assuming 20% refusal to participate in the case control 750 participants were required to be screened . Finally total of 911 participants were screened and 55 cases and 145 controls were recruited for the study The permission to the conduct this study in high schools was obtained from District Educational Officer. Students' study serial number, age, height (in cms) and weight (in kg) were entered in Epi-data software. Using WHO-Anthroplus, the data was imported and Z-score and percentiles were calculated for BMI (age adjusted). All students who had BMI percentile of 85% and above were considered as eligible to be selected as cases. From the same school, age and gender matched students (1:3) with BMI percentile <85 were selected as eligible controls. Among the eligible cases and controls, those who gave assent and parent's consent were included in this study. Bivariate analysis was done using Chi square test to know the associations between categorical variables. Independent t test was done to compare means between two groups. After dichotomizing different variables, uni-.variate analysis was done to generate an odds ratio and 95% confidence interval to study the association between overweight and factors related to demographical characters, social networking and psychological factors. Multivariate logistic regression analysis was done to adjust for confounding

Results : A total of 911 students were screened across 10 schools for overweight and obesity of whom, 548 (60%) were males and 363 (40%) were females. Among the 911 children, 115 (12.6%) were overweight and 3 (0.3%) were found to obese. The risk factors we looked into were categorised as social, psychological and behavioral. There was no statistically significant association found between gender, education of the parents and socioeconomic status. The psychological factors that where looked into were, depression, anxiety and stress. These risk factors were not found to be associated with obesity. There was a significant association between eating a high calorie snack like chicken pakoda, puffs and pastry and being overweight or obese

with an OR -2.02 95%CI(1.08-3.79) P value of 0.027.The children who used all other ways to keep in touch with friends had two times increased risk of being overweight or obese compared to the children who physically meet up CI(1.03-3.96) and a p value of <0.05.Children who used any mode of transport to school other than walking were at risk for obesity as compared to those who use other modes of transport with an OR of 1.95 95% CI (1.04-3.67)and a p value <0.05.After adjusting for all the risk factors high calorie food was found to be independently associated with overweight and obesity with an adjusted odds ratio of 2.38 , p value of 0.014 and 95% CI (1.189-4.764).

Conclusion: In this study we concluded that taking a high calorie snack was found to be an independent risk factor for obesity in adolescents.

Key words : obesity, adolescents, risk factors

1 Introduction

Obesity in childhood has been declared one of the most serious challenges of the 21st century. It is estimated that around 42 million children aged under five are obese worldwide, majority of whom live in the developing countries (1). It is one of the easiest of conditions to diagnose but is difficult to treat (2). In a span of thirty years the prevalence of obesity has doubled among children and quadrupled among adolescents in the United States. Being obese has many ill effects, immediate as well as long term. Immediate effects include hypercholesterolemia, high blood pressure and a condition called pre-diabetes in which the blood levels of glucose indicates a high risk for diabetes. Other effects include- joint pains, obstructive sleep apnea and social problems. When these individuals grow into adulthood they are at high risk of developing coronary artery disease, type 2 diabetes, stroke and many types of cancers including cancers of the endometrium, esophagus, kidney, pancreas, gall bladder, thyroid and ovary. As early onset obesity has significant later life risk of non-communicable diseases, there are likely to be substantial health benefits to the children in identifying those at risk of childhood obesity and intervening early{(2)}.

There are many causes attributed to obesity in children including genetic predisposition, familial factors, cultural factors, habitual factors, stress, and poor self-esteem. It is also associated with neurological, endocrinal disorders and depression. Medications like steroids, antipsychotics oral contraceptive pills also cause weight gain (3).

The prevalence of depression among adolescents in the world ranges from 5 to 70% (4). A cross sectional study was done in in the city of Ranchi to assess the prevalence of depression, anxiety and stress among young adults with a mean age group of 19.3 years. It showed that depressive symptoms ranging from mild to extremely severe was

present in 18.5% of the population. The results also showed anxiety in 24.4% and stress in 20% of the study population. However clinical depression was found in 12.1% and generalized anxiety disorder in 19% of the study population (5).

A prospective cohort study involving 9374 adolescents in the grades 7 through 12 was done to see if depressed mood predicts onset and persistence of obesity in adolescents. Baseline assessment was done for depression using Centre for Epidemiologic Studies Depression scale and also BMI percentiles were calculated using Centre for Disease Control and Prevention with follow up assessments a year later. Results showed that at baseline 9.7% were obese and 8.8% were depressed. Having depression at baseline was independently associated with being obese in follow up with an odds ratio of 2.06 and confidence interval of 1.18 – 3.56 (6).

Obesity is rapidly increasing in India with health consequences. Very few studies have looked at social, psychological and behavioral risk factors for obesity and its consequences in the Indian setting.

This study proposes to evaluate the social, psychological and behavioral risk factors of obesity in adolescents between the age group of 10 to fifteen years studying in government and government aided schools of Vellore using a case control design.

2 Justification

Non communicable diseases (NCD) cause more mortality each year more than all other diseases combined. Sixty three percent of deaths each year globally are due to NCDs, most of which occur in middle and low income countries. The share of out of pocket expenditure incurred for treating non communicable diseases in India rose from 31.6% as in 1995-96 to 47.3% in 2004. If NCD s were assumed to be eliminated for the year 2004 India's GDP would have been 4 to 10 percent higher that year (7).

More than 10% of world's adult population is obese and more than 1.4 billion adults are overweight. Around 3.4 million deaths can be attributed to overweight and each year. Certain proportion of disease burden is also attributed due to overweight and obesity for example, 44% of diabetes, 23% of ischemic heart disease and 7-41% of certain cancers (1).

In United States it is estimated that 8.4% of children from the age group 2 to 5 years were obese in the year 2011-2012. Among the 6 to11 year olds 17.7 % and 20.5% of children in the age group of 12 to 19 year old were found to This study is being conducted among adolescents is particularly relevant because adolescents comprise 18% of the population worldwide. Eighty eight percent of them live in developing countries. More than half of them live in South East Asian countries. India is home to the largest number of adolescents (243 million) followed by China (207million) (8). Since they are the future generation, it is essential that their health of tomorrow is ensured. It has been found that those who are overweight and obese tend to remain so through adulthood (2). So it is necessary to intervene when they are younger and tackle the problem at the earliest. There are many associated risk factors associated with obesity like unhealthy food habits, lack of exercise, family history of obesity,

psychological factors socioeconomic status. This study will attempt to study the association between many of these risk factors and adolescent overweight and obesity. Using Body mass index (BMI) instead of weight alone is more advantageous because it accounts for height and tells us whether the weight is ideal for height or not. But in children and adolescents the growth pattern varies with age and gender hence a measure which is more reliable than BMI is needed. BMI for age percentiles is considered the most appropriate measure for identifying obese and overweight individuals (9).

There is a complex relationship between obesity and mental health. There are several theories how obesity and mental health are linked. Some researchers are of the opinion that mental health disorders lead on to obesity whereas others have the opinion that it works in the reverse fashion and some consider this bidirectional (10).

Meta-analysis and longitudinal analysis were done on studies on depression and obesity. Unadjusted odds ratio were calculated and subgroup analysis was done. Obesity had increased risk of onset of depression at follow up the unadjusted odds ratio was 1.55 and 95% confidence interval 1.22-1.98 with a p value of <0.001. But in this study baseline depression was not predictive of overweight or obesity over time (4). This was one of the risk factors that is considered a little in detail in this study.

3 OBJECTIVE

To determine the social, psychological and behavioral risk factors for obesity among adolescents attending schools in Vellore district in Tamil Nadu

4 LITERATURE REVIEW

4.1 DEFINITION OF OVERWEIGHT AND OBESITY

Overweight or obesity is defined as the abnormal or excessive fat accumulation that presents a risk to health (8). It is usually defined by BMI cut offs and calculated by dividing weight in kilograms by square of height in meters (11). Among pediatric obesity researchers, the term obesity is seldom used instead terms like overweight and at risk for overweight is used. Overweight is defined as weighing in excess to standard level for height and age (12). After calculating BMI, the value is plotted in the BMI for age growth charts and percentile ranking is obtained. This can be used to assess the size and growth patterns of individual children. The percentile indicates the relative position of the child's BMI number among the children of same age and sex. There are separate BMI growth charts for girls and boys.

The various reasons put forth for this are:

a) BMI correlates more with body fat

b) Growth spurt is different in case of boys and girls

c) The amount of body fat changes with age

d) The amount of body fat differs between boys and girls

First BMI is calculated and the value is plotted in the BMI for percentiles charts and is available for both girls and boys separately from age groups 2 to 20 years.

The BMI percentiles for age are classified as underweight, healthy weight, overweight and obese

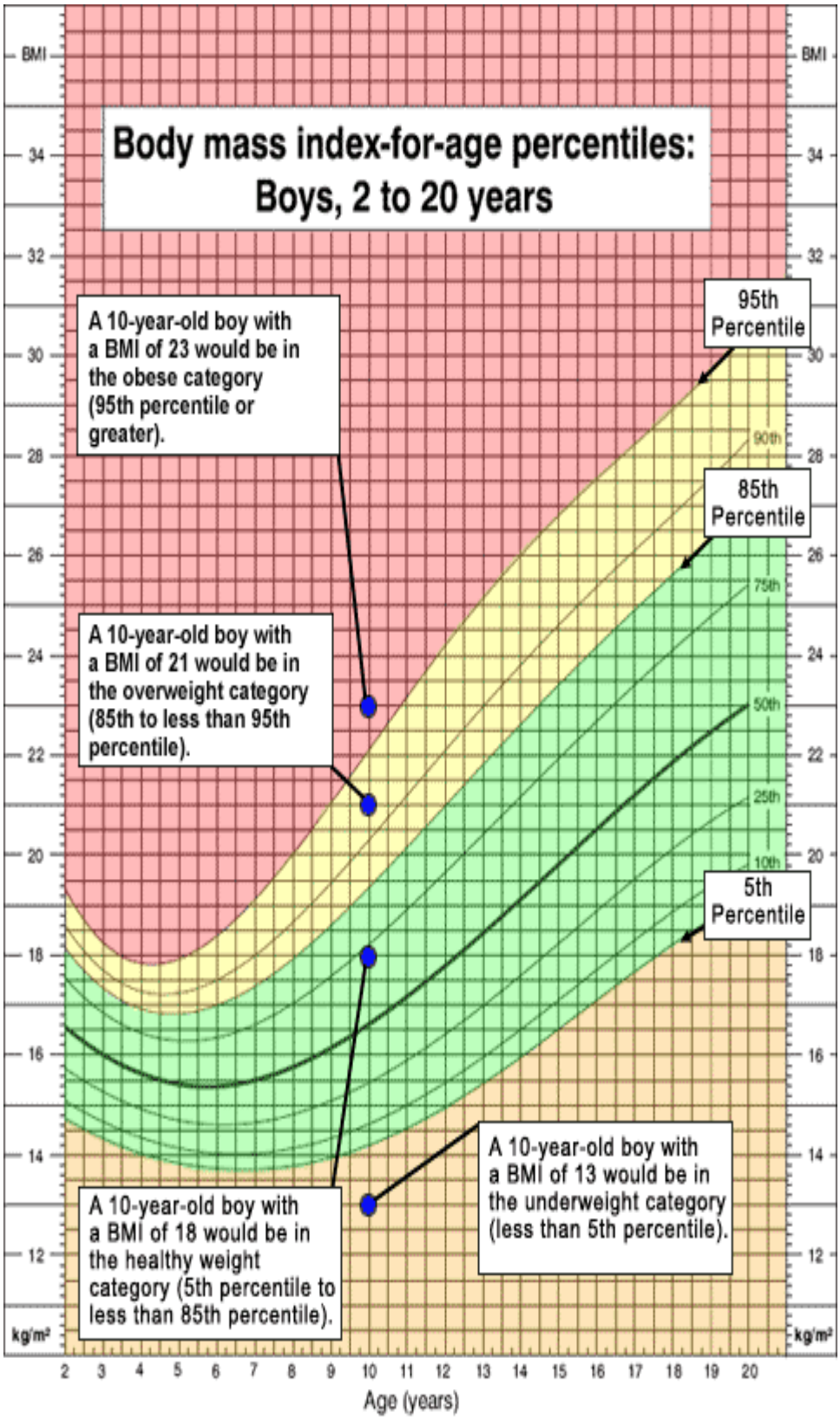
The American Academy of Pediatrics and Centre for Disease control and Prevention (CDC) has recommended using this tool to screen children and adolescents between the age groups of 2 - 20 years. Even though it has been recommended for use in children and adolescents, it cannot be used as a diagnostic tool. BMI may be equal at

times but the children can be under different categories at age. When BMI percentiles are considered the BMI values will have different implications for different age group. For example, a 10 year old with BMI 23 is above 95th percentile and he is obese, whereas a 15 year old with 23 is normal for his age (8).

Table 1: BMI for age and percentiles range

Weight status category	**Percentile range**
Underweight	Less than the 5th percentile
Healthy weight	5th percentile to less than 85th percentile
Overweight	85th percentile to less than 95th percentile
Obese	Equal to or greater than 95th percentile.

Figure 1: BMI for age percentiles for Boys



4.2 OBESITY – A TICKING TIMEBOMB

Obesity is a growing health problem globally. In 2010, the children who were overweight or obese under the age group of five years were 42 million in number. The country with the highest prevalence of obesity is the United States followed by the United Kingdom and Australia (8). Recent reports from the United States say obesity among young adults have become an important problem among army recruits. 71% of them failed to qualify for military service is because of obesity. National center for health statistics in the year 2007 to 2010 found that among young adults between the age groups of 18 -24, 23% were found to be obese. According to a study published by the American college of sports medicine in the year of 2008 only 7.6% of young adults get less than 60 minutes physical activity. The percentage of people getting disqualified for weight problems alone is 18% (13).

4.3 World scenario

Childhood obesity has become one of the most challenging and worrisome health Problem of the 21 century (11). Globally, among preschool children, there is a 60% increase in obesity since 1990. (14).

4.3.1 North America

Obesity has tripled in the last three decades and now United States has one of the highest obesity rates in the world. Every sixth child is obese and every third child is either overweight or obese. In the year 1970, 5% of children between the age groups 2- 19 years were obese. This has increased to 17% by the year 2008 and sustained so through the year 2010. Obesity is more prevalent in boys than in girls (19% versus 15%). Hispanic (21%) and non- Hispanics black (24%) have higher rates of obesity than non-Hispanics whites (14%). About 10% of children below the age of two years had high weight for recumbent length, a measure similar to BMI in this age group.

Canada has also seen a rise in childhood obesity rates. Among the 6-17 year old children the percentage of obesity was 9% based on the International Obesity Task Force (IOTF) cut offs in the United States. It is a bigger problem among the aboriginal groups in Canada. It was found that in the year 2006, 33% of aboriginal children in the age group 6 to 8 were obese. Thirteen percent of children between the age groups of 9 to 14 were also found to be obese.

4.3.2 Latin American and the Caribbean

Data from these countries are scarce. However, obesity has become a recognizable problem in the current times. Around 7% of children are obese according to the WHO standards in the year 2010. Though underweight is also a major problem in this region, it has substantially come down from 7% to 3% over a period of 10 years (from the year 1990 – 2010). Among school going children, a survey was conducted in Mexico using adult cut off points of BMI i.e. taking a BMI value of 25 as overweight and 30 as obese. It was found that a 10% of the 15 year old adolescents were obese and 33% were overweight or obese. Since adult cut offs were used, the true rates might be even higher. In Argentina, by screening 1688 children a representative sample between the age groups of 10 and 11 years, 35% of the children were overweight or obese according to the CDC's definition and 4% were stunted. It is seen that stunting later on leads to obesity.

4.3.3 Europe

The data from European countries is not complete, but the problem of obesity very much exists here too. It has increased over the years but has also seen plateauing in some countries and certain age groups. In a systematic review of studies conducted in 27 countries in European

Union, Spain had the maximum prevalence of obesity 32 % and Romania had around 12%. Some data were available from 5 countries where they had repeated the study among the age groups of 2 to 5 years and found that rates had increased from 18% to 23% in the years 1995 to 2002 respectively. Thirteen countries surveyed for obesity in 2007 and 2008 among school children showed a rate of 24 % overweight between the age group of 6 to 9 years.

4.3.4 Africa

Even though stunting underweight and hunger are more common in African countries, obesity is on the rise. The rates have doubled over a period of a 10 years from 4% to 8.5% in the year 1990 to 2000. This rise is centered more around northern part of Africa than rest of the continent. Obesity has tripled since 1990, with one in six preschool children being overweight or obese. In children and adolescents 17% girls and 11. %6 to of boys between the age groups of 6 to 13 were found to be overweight and obese in the year 2000.

4.3.5 Asia

Asia, even though hunger remains a major problem, obesity has also a growing problem in almost all regions except Japan where 5% of preschoolers were estimated to be overweight or obese in 2010. Among the school age children and adolescents, the percentage of overweight and obese children was estimated to be 14% boys and 9% in girls. Another survey done in Kuwait in 2006 showed that between the age groups of 10 to 14 years, 44% and 46% of them were obese among boys and girls respectively.

4.3.6 Oceana

This includes major countries like Australia and New Zealand. Systematic review of studies conducted from the year 1985 to 2008, shows an increase of obesity percentage from 2% to 18%. The percentage of people who were overweight were

estimated to be 21 to 25% and about 5% of them were obese. In New Zealand children between 5 to 14 years 24%.of the children were overweight and obese (10).

4.4 INDIAN SCENARIO

Malnourishment is prevalent in India. The previous government had called it a "national shame" to have more than 40% of the children in India as underweight (15). Obesity is also an equally emerging problem now with 20.6% of boys and 18.3% of girls being overweight or obese. A meta-analysis of around nine studies comprising 98,862 students showed a prevalence of overweight to be 12.64% with a 95% confidence interval of (8.48%- 16.80%). However obesity had prevalence of 3.39% with a 95% confidence interval of (2.58% -4.21%) (16). A study done to compare the difference between obesity and overweight among rural and urban children in Surat, Gujarat showed a significantly higher prevalence of obesity among urban as compared to rural population with the prevalence of 12.8% in rural areas and 14.6% in urban areas. After adjusting for age and gender urban students still had a higher risk of developing obesity compared to the rural male gender (17). In a hospital based study done in India 24% of the males and 31% of the females were obese (18). Another study done in 2005 to see the relationship between overweight and hypertension in Ernakulum district of Kerala showed a prevalence of overweight 6.57% in the age group of 5 -16 years. Systolic and diastolic hypertension was found in 17.34% of overweight as compared to 10.1% of normal students with an odds ratio of 1.87(19). Yet another study done in Karnataka in the age group of 12- 15 year olds showed that being from a high SES (socio economic status), had twice the risk for being overweight. The study also showed 21 times higher risk of being overweight for

those who indulge in less than two hour per week of physical activity, 7.3 times higher risk for people watching television and playing computer games for more than four hours per day and 5.6 times higher risk to those ate chocolate on a daily basis.in this study. The prevalence of overweight and obesity were 9.9% and 4.8% respectively.(20)

North eastern States like Manipur, Meghalaya Assam and Nagaland also have significant number of children with obesity. A cross Sectional study done among 3356 students studying in class eight to twelfth students shows prevalence of overweight as 4.2 % and obesity as 0.8% (21).

In a cross sectional study of 540 students from urban Imphal, 5.46% of the boys were overweight and 1.17% obese. The same study showed that 6.69% of girls were overweight and 0.36% of the girls were obese. Another cross-sectional study done in 31 middle schools and high schools of Wardha city, children with overweight and obesity were 3.2 % and 1.2 % respectively. There was association with urban residence, fathers and mothers occupation, English as the medium of studies and child playing less than 30 minutes outdoor. Children included in the study were classified according to income as low income group and middle income group according to the school in which they studied. The low income group had a prevalence of overweight and obesity of 0.2% and 1.4% compared to in the middle income group where the prevalence of obesity was 0.6% and overweight 6.7% (22)

4.5 Tamil Nadu Scenario

In the state of Tamil Nadu many studies have been done. 18995 children were screened in the age groups 6-11 years and 12 – 17 years done in 51 schools, which included 31 private and 20 government schools. The prevalence of obesity was 21.4% and 3.6% in private and government schools respectively with an odds ratio of 7.4 (95% CI 6.3-8.6) Prevalence of hypertension in this study was 20.4% among overweight and obese and 5.2% among non-obese(23).

In a study done in 18 states of India, among 7 to 17 year old students, 19% of the students from Tamil Nadu were overweight or obese (24). A study done in Salem in the age groups 11- 15 years showed overall prevalence was found to be 12.11% among girls was 14.65% and boys 11.95%. Higher prevalence again was seen 14 years among 13.17% and 13 years in girls 18.26% in girls (25).

In the Union territory of Puducherry, a study was done among 6-12 years using a multistage random sampling from 30 clusters and the prevalence of overweight was 4.4% and obesity was 2.1%. Manipal had 8.66% of overweight 4.69% obese (20). Another study was done assessing the prevalence of obesity over a period of 17 years among the affluent adolescent girls living in Chennai. The two studies were compared with BMI as a parameter. The first study group of 1981 (Group I) had 707 girls and second study in (Group) II 610 girls. Both studies had shown 9.6%and 6% prevalence of overweight and obesity. Study also revealed that the BMI over the years has increased from 1981 to 1998 and also had reached the international reference standards (21). One in every five children in Tamil Nadu is either overweight or obese. This is alarming and underlines the need for interventions to be taken in many ways to tackle this situation (24)

4.6 RISK FACTORS OF OBESITY AMONG ADOLESCENTS

4.6.1 Gender

Various studies showed different results when it comes to prevalence of obesity in girls and boys .Some studies showed higher prevalence in girls and some in boys. A study was done in 15 schools in the age group 11- 16 years shows higher prevalence of obesity among boys than in girls. Another study done in 5 different districts of Tamil Nadu showed higher prevalence of girls than in boys. The prevalence of obesity was 29% among boys and 32% among girls. A study done to see the trend during the years showed there is an increase in prevalence in obesity from 4.94% to 6.57% from the year 2003 to 2005 and this result was found statistically significant (23).

4.6.2 Fathers and mothers education

A study done in Germany among 2020 children found parental education had a strong association with obesity (28). The education of the parents had an influence on what the children ate. The results shows that people with lower education feed their children with foods rich in fats and sugars (29). It is also seen children belonging to households where father's education is college degree and above had a lower chance of being obese than those with lesser education. This relationship is not consistent across culture and all ethnic groups (30).

4.6.3 Socioeconomic status

Low income groups are seen to be more obese than children from high income groups. The prevalence of obesity among boys above the poverty level is 11.9%, but the prevalence of obesity below the poverty level 21%.38% of the people live in households between 350% and 130% and another 38% below 130% of the poverty (29). The percentage of obese girls who were living above poverty level was 12% and 19.3% were below poverty level. Among the 12 million children and adolescents who are obese 24% of them live in households with income above 350% the association between socio-economic status and obesity differs by gender, age and country. In developing countries, people from higher socio-economic status who consume calorie rich diet are at risk for obesity. In industrialized countries, low socioeconomic status have more access to energy rich diet and hence at more risk for obesity (31)

4.6.4 Lack of physical activity

Physical activity is any body movement in skeletal muscle increasing the resting energy expenditure (27). The energy expended while doing any physical activity largely depends on body weight. A person with greater body weight has greater energy cost of a specific activity. It's seen that the time spent on sedentary activity is directly proportional to adiposity levels. It's recognized as one of the important risk factor contributing to various chronic diseases. It is one of the major contributors for the obesity in various countries. Physical activity and it's relation with obesity has also been a controversial issue. However studies done in adults suggest longer bouts of low intensity exercise may be more beneficial than high intensity exercises. A systematic review of 23 studies was carried out to see the relation between active travel to school (ATS) and health related fitness. ATS is identified as various modes

of travel like walking cycling skate boarding to school which are ways of physical activity in adolescents. Out of the 23 studies 48% of the studies showed ATS were associated with associated with beneficial health status. Four studies found positive association between ATS and health related fitness.(32). A national survey done on children's health in 2007 showed that there was statistically significant relationship between neighborhood parks and playgrounds and childhood obesity. The availability of neighborhood playgrounds in the neighborhood decreased the obesity by 1%, 9% and 23% for males and by 2%,17% and 28% in girls.(33).Another study done to assess how healthy weight were children who had access to playgrounds showed that children who had playground within

1 kilometer had five times more healthier weight than those without the facility (29).

Both these studies ascertained the fact that availability of the playground in the neighborhood made the difference for them to go out for physical activity than those who hadn't. The effect of physical activity also depends on accessibility availability of playground in the neighborhood (26).

4.6.5 Time spend in television and computer

The decrease in physical activity may be due to increased time spend in watching television video games and internet (30). Crespo et al did a study among 4000 students in the age group of 8- 16 years and suggest obesity is more among people who spend more than four hours watching television and is less among people who watch less than 1 hour per day.(34). In the United States children between 8-18 years spent on an average of 7.5 hours a day watching television or other entertainment media like computer, video games, mobile phone and movies. 83% of children watch

television around for around 1 hour 57 minutes a day. It makes children more prone for obesity because it's taking up there time for physical activity and also making them snack more in between meals and eat more sitting in front of the television(35)

4.6.6 Eating calorie rich food

In United States people are eating more calories than they did 30 years ago (32). Most of it is ready to eat items available in restaurants and fast food. These kinds of food contain more calories ,saturated fat.(36) A study was conducted to see association between obesity and overweight and their associated lifestyle factors. It was found that dietary behaviors like being vegetarian and non-vegetarian diets didn't have many effects on overweight and obesity, but people who had the habit of eating junk food and chocolates had higher risk of being obese or overweight. The number of visits to the restaurants in a week had significant association with the people who are obese because they visited restaurants more than once a week than their normal weight counterparts(37)

4.6.7 Depression, Anxiety and Stress

Stress

Stressed children are more prone to emotional eating and also to overeating (34).There are many stressors that affect children like parental separation/divorce, physical bullying, maltreatment or abuse and living in foster care with frequent placement changes. These major stressors in children lead to overeating are coping

mechanisms. Stress when becomes chronic, can cause inadequate sleep, and hesitancy in taking part in leisure activities involving physical work. Stress can adversely affect the immune system and the subjects may be prone for recurrent infections. Stressful living situations, including poverty, or generalized anxiety or depression can stimulate neuroendocrine responses. Hypothalamic-pituitary axis gets activated in such situations causes intra-abdominal adiposity, insulin resistance and excessive cortisol production (38).

A study of 3598 girls and 3347 boys from the birth cohort of 1986 who were followed up since their antenatal period in Northern Finland. The stress related eating behavior was more common among girls, around 43%. The stress driven eaters had more prevalence of overweight obesity and abdominal obesity. Stress driven eating were more frequent with girls in those who use tobacco, had reduced sleep, untimely family meals and increased frequency in the consumption of chocolate, sweets, light sodas and alcohol. Among boys, those stress related eating behavior with frequent consumption of sausages, chocolate, sweets, hamburgers and pizza were more prone to stress driven eating. (39).

4.6.8 Depression

There are differences in how depression is diagnosed in young people and in adults. Mood unlike the adults may be irritable rather than depressed or anhedonic. Data from National Health and Nutrition Examination Survey showed prevalence of major depressive disorder was 2% in children and 4-8% of adolescents. One of the issues that concern people who are treating depression in adolescents is that not many are responding to any forms of treatment. Treatment of Adolescent depression study

(TADS) reported that only 37% of adolescents treated with intensive, combination medication and psychotherapy treatment achieved remission at 12 weeks (40). In a survey conducted by National Health and Nutrition Examination Survey (NHANES) III, data showed that among the most obese adolescents, in the range of 95th to 100th percentile, there was significant levels of major depression, 20% of them in boys and 30% in the girls.

Compared to their normal counter parts obese and overweight children have more social and academic problems like poor scholastic performance and low self-esteem, anxiety, depressive disorders, and a greater number of suicide attempts.(41)

4.6.9 Anxiety

Children with obesity may also have symptoms of anxiety. They may be anxious in matters of eating, physical activity, or in social settings. Anxiety around food consumption may be initial alarming sign to suspect. They might avoid social gatherings for the for the fear of being teased. Some of them also have more concerns about their body size. Common symptoms will be headache and stomach ache which will be complained by children who want to avoid anxiety inducing situations. Other associated symptoms will be sweating of hands and increased heart rate.(42)

4.6.10 Social networking – Its impact on obesity

Social networking is one of the major developing topics in the development of non-communicable diseases especially obesity. In a study done on 12,067 people

from1971 to 2003, longitudinal statistical models were used to see if obesity or weight gain in one person is associated with weight gain in his or her siblings , friends spouse etc. It was found that a person's chance of being obese increased by 57% if he or she had a friend who became obese in a given interval. In case of siblings, if one sibling became obese the chance that other becoming obese increased by 40%. If a spouse became obese the chance of being obese increased by 37% (38).

Social networking suggests that obesity is a result of interaction between biological behavioral and environmental factors. Social networks suggest that acquaintance such as family, schools, neighborhoods or community are interconnected and influence one another. It has significance in that the recent developments in the science of obesity genetics and its use as a preventive factor for development of overweight and obesity. A latest study suggests that 70% of adiposity is due to genetic factors and the rest due to socio environmental contributions .Other studies have suggested traits like eating distribution hunger susceptibility and eating when not hungry run in families. In a study among adolescents tend to cluster people with same weight status(44).

In Another study done in Loyola University, researchers found that a person's friends circle may influence his or weight. Students were more prone to gain weight when their peers were heavier and the converse was also true to those with lean friends are more likely to be slim. The reason why obesity clusters in network is because the way they choose their friends. It was also found even after controlling for the friend selecting process, a significant link is found between student's weight and friends circle. Examples are, a student with a borderline overweight student with lean friends had 40% chance that the students BMI would drop in the future and 27% chance that it would increase. If a borderline overweight had obese friends, there was a 15%

chance that the student's weight would decrease but there was a 56% chance that his weight would increase (8).

4.7 INTERNATIONAL OBESITY TASK FORCE (IOTF)

International obesity task force is an extended arm of the International Association of the Study of Obesity. IOTF main aim is increase the awareness of obesity and the raising issue of overweight. It works with World Health Organization and other NGO s and stakeholders who have the same area of concern.

Main objectives of IOTF are

1) Articulate policies which direct against prevention of obesity and its translation into research and practice
2) To create knowledge exchange system between individuals and organizations working in obesity Prevention.
3) Undertake research, training and other projects to further obesity prevention
4) Advocate for effective, evidence-informed policy actions for obesity prevention at national regional and global levels (45)

4.8 WHO CONSULTATION REPORT ON OBESITY

In 1997 the WHO, together with the IOTF, held an expert consultation on obesity to review the extent of the obesity problem and examine the need to develop public health policies and programs to tackle the global problem of obesity. The consultation resulted in the publication of an interim report: "Obesity – preventing and managing

the global epidemic" (WHO 1998) and the subsequent WHO Technical Report Series many countries have already started programs to tackle obesity in their country. The greatest problem we face now is that obesity is not only the disease of the developed countries but also developing countries. For example in Singapore, start of the 'Fit and Trim' program has impacted many a lives of the students. The program focuses on promoting healthy eating habits and encouraging physical activity. In Australia they adopted strategies throughout the country in a such a way that environment in that country in less 'obesogenic'(46).

4.9 Tools used in study

4.9.1 Defining obesity in child hood – limitations

An appropriate scientific definition of obesity in childhood is not available yet this is because there is no agreement among researchers on the adiposity index to use and on the best cut-off to define overweight and obesity in children. Obesity is generally defined as the abnormal or excessive accumulation of fat in adipose tissue to the extent that health may be impaired. The task of measuring fat from the body that causes impaired health is an herculean one. However, there are laboratory methods that quantify adipose tissue mass. These include underwater body density measurement and body fat content estimated by the dual-energy X-ray absorptiometer (DEXA). Newer and effective methods are also available such as magnetic resonance imaging (MRI) and Computed tomography (CT), which provide researchers with more details in this adiposity in the body, but most of these methods are costly and hence has limited use when it comes to research purposes. In large-scale population surveys and clinical use, index of body weight adjusted for stature is commonly used as a standard for the body fat content. These indices are defined as different combinations of weight and height, such as weight divided by height or are defined as weight expressed as a percentage of mean weight for a given height and sex. The most widely used is Quetelet's index, better known as body mass index (BMI), which is body weight (kg) divided by height in meters squared.

This index has been show to correlate weakly with height and strongly with body fatness in adults. The problem with BMI is that it cannot distinguish between lean body mass and body fatness, so it varies with body composition and proportions. For example body fatness is more in females than in males with the same BMI. The problem is even more difficult in case of children because the height keeps on changing and so does body composition. But much confusion remains about how to choose an appropriate reference population and how to select appropriate cut-off point for defining a child as overweight or obese.

4.9.2 Current WHO Definitions

The current recommendations of World Health Organization (WHO) for defining overweight and obesity in children and adolescents separately, shows the complexity of the situation. WHO recommends that weight-for-height Z-scores are used as definition for obesity in children up to the age of 10.

- In adolescents (aged 10–19 years), WHO defines "at risk of overweight" as an age-sex-specific BMI greater than the 85th percentile of the reference population. Both these definitions require the use of growth standards or references.
- WHO has proposed the development of new international growth reference curves and BMI reference curves.
- The WHO international reference curves for children and infants aged less than 5 years has been in development for a number of years, but as yet these have not been published.

- One of the definitions that have come up recently is the one proposed by Centers for Disease Control and Prevention (CDC) by developing new growth charts, which include an age- and sex-specific BMI reference for children and adolescents aged from 2 to 20 years of age. These charts also include a sex-specific weight-for-height reference for children aged 2–6 years the reference population for developing these curves comes from, data collected from five national health surveys carried out in between the years of 1963 and 1193 also from another five different data sources. Each of the CDC BMI-for-age gender-specific charts contains a series of 10 curved lines curved lines indicating specific percentiles. It can be used to identify underweight and overweight by health care professionals. Based on the specific percentiles, the definitions for children being underweight, at risk of overweight or overweight are as follows (42)

4.10 MEASURING TOOLS

STADIOMETER

Its benefits from other ways of measuring height

The measurement of stature (standing height) was used to determine the participants' Body Mass Index (weight/height in meter square). The Stadiometer used for the study was mobile Stadiometer 217 of Seca Company. It is different from other systems from other finest of Stadiometeres by its top quality materials skillfully designed assembly system. It is appropriate for doctors, nurses hospitals and easy to carry around for medical examinations to patients homes and is easily carried to schools for screening programs When disassembled, the stadiometer can be suitably transported to any local setting without the need for any support for it to be fixed.

Quick and easy

The fold away height measuring rod of the stadiometer seca 217 can be assembled together easily and fast to be fixed to attached to a steady platform. Unlike the wall mounting type there is no need to be attached to any support.

Large platform for easy use

The mobile stadiometer has a strong and robust base that it can be used in any surface anywhere. The in between connections of the various parts of the height rod and also the spacer provided and the spacer between wall and rod prevent it from shaking and trembling and move from a fixed place which can cause difficulty in measuring the

readings properly. It's an instrument fitting to people who are particular in getting proper measurements any and every time.

Fig 4.2 Seca 217 dissembled

Specific reading of results

The vast and steady head piece ensures proper and accurate results as subject stands under it. It is made of a firm non-warping plastic that effortlessly slides in position. Yet another notable feature is the clearly marked scale on both sides which helps the investigator to call out loudly to the one who is noting down during the measurement process which permits a readout of results during the measurement process. This assures a well-defined measuring of height up to 205 cm.

User friendly and used in any surface

The measuring rod can be dissembled and easily carried into any place and can be used any form of surface since it has a firm base. That's what makes is more popular than other stadiometers and preferred by many investigators in many of difficult settings like hospitals, community and schools studies which can be at times difficult.

Fig 4.3 Seca 217 mobile stadiometer.

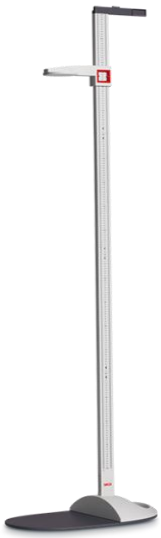


Table 2. Technical data of Seca 217 mobile stadiometer (47)

Measuring range	20 - 205 cm /8 - 81"
Graduation	1mm 1/8"
Dimensions WxHxD*	328 x 2,145 x 574 mm
Device Weight	3.6 kg

*Width x Height x Depth

Principles of measuring height

1) The participant stand with their back against the measuring rod of the stadiometer, heels together. The back (scapulae), buttocks and both heels should be touching.

2) Arms should be relaxed on both sides of the body are relaxed and hanging loosely at the sides shoulders relaxed (checked by running your hands over them and feeling the relaxed trapezius muscle).

3) The head should be in the "Frankfort Horizontal Plane". It's the line joining the lower eyelid margin and upper margin of the external auditory meatus.

4) Bring the head piece gently on top of the head. This makes sure that no hairstyle disturbs the measurement and presses down on the hair, thus flattening any hairstyle.

5) Ask the patient to breathe deeply in should not alter this position till measurement of height is over like raising the heels from the floor etc.

6) After this have the participant step out of the stadiometer and for the measurement of the next participant repeat steps 1- 5 (48).

Calibration of stadiometer

Metal rod of 600 mm placed between the head piece and the base if the height rod not does measure the same height as that of the metal rod the distance between the pieces of the rods needs to be checked.

Digital floor scale with low platform

Seca clara 803 was used in this study. This instrument is one of the best choice when dependable and consistent measurements have to be made for weight monitoring and study purposes such as in schools hospitals and fitness centers. It's easy to use and also easy to transport also has a lifelong guarantee even when it's used frequently.

a) Non-slippery platform

The platform has a non-slip covering which assures a non-slippery comfortable and firm footing. The additional attachment non slippery rubber feet add to an extra grip for the stability.

b) Low platform

The four load cell technology is applied to design this instrument has given it a sleek design allows easy mounting to the platform. Special two component material allows the plat form to be softer and harder wearing.

c) High stability

This instrument is made of extremely high quality plastic which make the surface very hard. Thus the surface is protected from wear and tear. The surface which is smooth makes it easy to clean with spirit.

d) Easy to carry and transport

This digital floor scale weighs only 1.4 kilograms which makes it extremely easy to carry and makes it easy to carry and light for transport.

e) Low power consumption due to automatic switch-off

The best part of the machine the amount of power it saves because of the automatic switch-off with just one set of batteries about 12,000 times weight can be measured. Well ahead of time the machine indicates the change of batteries(49)

Table 2: Technical data of digital low floor scale

Capacity	150 kilograms/330 lbs.*
Graduation	100 grams /0.2 lbs. *
Dimensions WxHxD*	325x35x315
Digit height	28 mm
Weight	1.4 kilograms
Power supply	Batteries

*lbs. – pounds , WxHxD –width x height x depth

Figure 2: Seca 803Scale

Calibration of weighing scale

Weighing scale before use needs to be calibrated to make sure that accurate weights are being measured so that errors can be avoided. It's ideal to measure the weights ideally at the site where the measurements are to be made. Any weighing machine will be affected by extremes of climate, extreme movements, shakes temperature changes either because of constant use or over with time. Electronic weighing machines are in no way different in this regard and much more electronic machines can have electromagnetic, electrical and magnetic effects. Many of the effects will be obvious and easy to detect but others will display as inconsistency in weighing and instability , however both these issues needs to be addressed so that accuracy of measurements is maintained as much as possible (50)

- Turn on the weighing machine and weight till zero appears in the monitor and make sure that the weighing scale is the desired scale you would want it to be.
- Then place it standard weights which are 10 kg and above. Make sure that the weights are being placed in the center of the weighing scale and not on sides or on the edges, as these weights will not be detected by the weighing scales and weighing displayed will not be correct. When more number of weights are being at a time make sure that there is very little time in between keeping weights one over the other as delay would cause the machine to display the already existing weight on its platform.
- Make sure during the measurements and between weights are being changed the machine is not disturbed.
- One should also be careful to watch out for the display of zero between every new measurements (50).

Depression Anxiety Stress scale 21 (DASS)

Introduction

Depression Anxiety Stress scale is a 21-item questionnaire which is used to measure three of most important negative emotions states of life namely depression anxiety and stress. Each of the three scales contains with 7 items in each, which is again divided in 4 subscales. The Depression scale assesses a state of unease and dissatisfaction (dysphonia), desperateness devaluation of life, belittling of self (self-deprecation), disinterest noninvolvement, anhedonia and inertia. The Anxiety scale assesses autonomic arousal, skeletal muscle effects, anxiety rising in certain situations, and subjective experience of anxiety and its effects. The Stress scale (items) is sensitive to levels of longstanding non-specific arousal. It also assesses relaxing difficulties, nervous arousal, and being easily unhappy disturbed, short tempered impulsive and irritated. The participants are to rate their experience in each of the mentioned state in the questionnaire in a 4 point scale or frequency as in the past week.(51).

Uses of DASS

Each question in this is scored between 0 to 3, where 0 represents did not apply to me last week (did not apply me at all over the last week) to 3 (applied to me very much and most of the time .The essential function of the DASS is to assess the gravity of the core symptoms of Depression, Anxiety and Stress. Hence DASS helps us to measure not only the gravity of each Symptom in a patient but also can be used to measure improvement of symptoms when he or she is subjected to treatment. Even

though it one of the useful tolls it cannot replace a detailed history situational analysis and clinical examination, which means it's not a diagnostic tools to asses these specific emotional states of life.

Scoring of DASS

Scoring template which has been provided has made it simple to score the questionnaire.

- Each response of the question is scored in the side of the question in the template for depression anxiety and stress respectively.
- Finally there will be score each for depression, anxiety and stress like a score under D, A and S.
- Each of this score is multiplied by two since it's a short form of form of DASS long form with 42 items (52).

DASS was developed to screen the non-clinical population. It can be used to screen adolescents and adults. It can be used children as low as 12 years of age provided they are given questionnaires in their own language (53).

Validity and reliability of DASS

There was conducted among 508 young students around of college in the age group of 18- 24 in university of Kentucky to evaluate the psychometric properties of 21- item DASS. In case of internal consistency, Cronbach's was calculated for all the three scales before and after analysis the reliability of all the three items remained the same.

Cronbach's alpha score before the factor analysis was 0.90 for Depression, 0.83 for Anxiety, 0.86 for Stress. Following factor analysis the alpha scores for anxiety and stress reduced by.03 and.04 respectively, however for depression it remained same. For construct validity, separate multiple regression models were calculated for the DASS-21 as total and for the subscales scores. The objective of this was to separately analyze the ability of maladaptive coping, adaptive coping, and satisfaction to predict each of the three different emotional states being incorporated in DASS namely depression anxiety and stress and also total score for DASS. The regression coefficient was used beta was used to determine the strength and direction of the association. Most of the scores were found to be significant with p value less than 0.001.(54)

Another study done among school students studying in class ninth to twelfth standard, DASS 21 was used in this study to assess depression anxiety and stress among affluent young school children. The obtained in these three domains were significant. Depression was found to be higher in females than in males significantly more among the females (mean rank 132.5) than the males (mean rank 113) p=0.03. All three emotional states were again found to be significantly higher in Board exam going classes like tenth standard and twelfth standard rather than ninth and eleventh standard the non-Board exam going classes respective scores being (p=0.025) for depression, (p=0.005) for anxiety and (p<0.001). All three scores were inversely related to the academic performance of the student. Depending on the adverse events in the life of a student in the last one year depression and stress were significantly related to it (55). A study was done in 677 students in Belgium for factor structure and measurement. Results from the DASS 21 confirmatory factor analysis revealed that negative emotionality in adolescents are best represented by the tripartite model of

anxiety depression and stress. The findings provide support for the validity of the tripartite model of negative emotions and the use of DASS 21 in adolescent boys and girls. Cronbach's alpha coefficients were good for all the three scores both among boys and girls the scores being depression scale (boys = 0.78 girls 0.06) anxiety scale (boys a = 0.74;girls a = 0.72) and the stress scale being (boys a = 0.76; girls a = 0.81)(56).

A 24-hour recall instrument of the daily activities and the questionnaire were compared for validity using Spearman correlation coefficients. (Kappa values) were calculated to assess the proportion of agreement based on categorization of the distributions of the physical activity variables into quartiles. Results showed correlation coefficients ranging from 0.49 to 0.70 in girls and from 0.56 to 0.83 in boys, all statistically significant. Limited concordance capacity was found in the Bland –Altman plots between test-retest of the questionnaire. Validity of IPAQ was modestly correlated for each activity with the 24-hourrecall data (range 0.09-0.51). However, the validity indicators increased considerably when the time spent in moderate and intense activities were reported, and these values were higher for older boys (57).

The relationship between mental health and obesity

The results from the most recent systematic review of longitudinal studies suggest a bi directional relationship between obesity and depression .The study suggest that there is 55% increased chance of developing depression over a certain period. In case of depressed individuals 58% had increased chance of being obese (3).

Research has showed that there is a bidirectional relationship between obesity and depression. The main mediating factors that influence the bidirectional relationship between obesity and mental health disorder are:

a) **Obesity as a cause of mental health disorder**

- Behavioral – low physical activity unhealthy diet and uncontrolled eating
- Biological –improper hormonal pathways
- Psychological – low self-esteem and body dissatisfaction
- Social – stigma and rejection

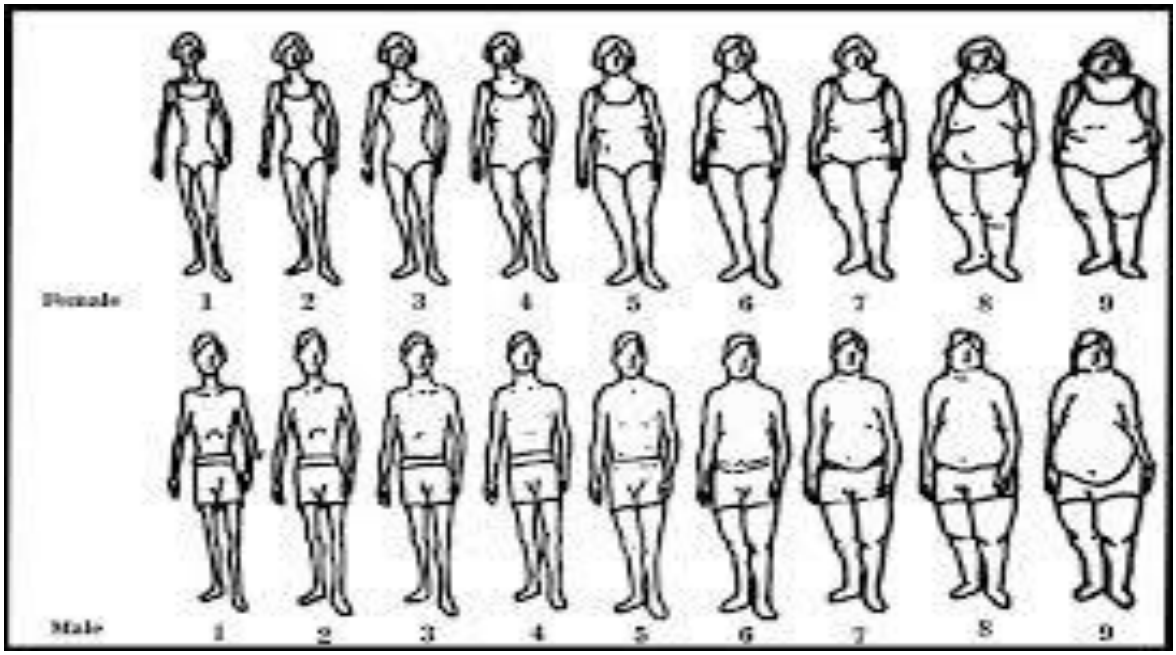
b) **Mental health disorders as a cause of obesity**

- Behavioral- lack of motivation to exercise
- Biological – medications side effect
- Psychological-low expectations regarding weight loss
- Social – psychosocial stressors in the house hold

Stunkard scale

Stunkard scale is a series of images from 1 to 9 representing body images 1 being the thinnest and 9 being the heaviest.it is mainly used to perceive body image of self, participant is usually asked to pick a silhouette which closely resemble them. Silhouette 1 is the thinnest and 4 usually represent BMI 23. Silhouette 5 usually represents overweight and 9 represents fattest of the lot(58).In this study its used for perception of the friends body image in the friends circle of the study participant.

Fig 4.5 Stunkard's body image



Childhood Obesity and its health effects

Childhood Obesity has immediate and long term effects which are prone for risk of cardiac diseases. A study done to assess cardiovascular risk factors among obese and overweight children and adolescents showed that 39% of the children with BMI > 95^{th} percentile had at least two risk factors. Sixty five percent had excess adiposity and 65% had a BMI which was comparable to adults. Of the adolescents with BMI >= 99^{th} percentile, 59% had at least two risk factors. Among all the obese adolescents 94% had excess adiposity and 88% of the children had BMI compared with that of adults.

The adverse health effects of obesity are:

1) More prone for high levels of cholesterol and high blood pressure
2) These children have a propensity to pre-diabetes, a condition in which blood glucose is increased and can cause development of diabetes in the future
3) The children who are obese will have problems with bones and joints and have sleep apnea.
4) There can also social and psychological problems like low self-esteem and stigma to public places.

Long term effects

1) Children who are obese as adolescent are likely to obese when they grow up as adults
2) These children hence are prone coronary artery disease; type 2 diabetes mellitus cardiovascular vascular accidents, various types of cancers and osteoarthritis.
3) Being obese poses risk for various types of cancers like cancer of the cervix, ovary colon, breast, kidney, pancreas, esophagus, endometrium, thyroid, prostate, multiple myeloma and Hodgkin's lymphoma
4) Metabolic syndrome assemblage of symptoms of risk factors like obesity, impaired glucose tolerance, hypertension, dyslipidemia, all of which are fore runners of cardiovascular event.

4.9.1 Treatment of obesity

It's a multidisciplinary task involving a group of specialists, pediatric physician, nurse practitioner, dietician, physical instructor, behavioral therapist and a social worker in addition to a motivated team of parents, caretakers, teachers and policy makers. The main aim is to maintain the weight and not to bring down the weight. This will be followed slow reduction of weight reduction to improve BMI. The long-term goal is to improve quality of life and avoiding the immediate and long term adverse effects due to obesity.

Targets in weight loss

1) In the age group of two to five years those who are overweight are recommended to maintain and monitor their present weight.

2) While obese children in the same group, are permitted 0.5 kg /month weight loss.

3) Children in the age group of 6- 11 years who are overweight weight maintenance is adequate

4) For obese not more than one kg per week should be aimed.

5) Same principle as for 6-11 years is applied to children who are overweight and obese in the age group of 12-18 years. This should be accompanied by the following

1) Enhancement of physical activity

2) Sedentary behavior restriction

3) Pharmacological treatment

4) Surgical treatment

All these are possible with a motivation from the personal level of the child as well as from the parent (59).

Observational studies

a. Descriptive studies
b. Analytical studies
    i. Ecological
    ii. Cross-sectional
    iii. Case-control
    iv. Cohort

1. Experimental studies Interventional studies
    a. Randomized controlled trials
    b. Field trials
    c. Community trials

A case-control design was chosen for this study. A paradigm is followed that proceeds from effect to cause in case control studies, also known as retrospective studies. In a case-control study, individuals with a particular disease or condition (the cases) are selected for comparison of individuals in whom the disease or condition is absent (the controls). Cases and controls are compared with respect to existing or past attributes or exposures which are thought to be relevant to the development of the condition or disease under study. In a population based case-control study, all cases of the study disease occurring within a defined geographical area during a specified period of time are ascertained; the entire case series or a random sample of it is selected for study. The case-control method of investigation is often research strategy of choice, particularly when initiating an exploratory study of disease colloquially called “a fishing expedition” is one which multiple hypothesis are proposed for investigation.

Advantages and disadvantages of case-control methodology

Advantages:

- Well suited to the study of rare disease or those with long latency.
- Relatively quick to mount the conduct.
- Relatively inexpensive
- Existing records can occasionally be used.
- No risk to subjects.
- Allows study of multiple potential causes of a disease.

Disadvantages:

- Relies on recalls or records for information on past exposures.
- Validation of information is difficult or sometimes impossible.
- Control of extraneous variables may be incomplete.
- Selection of an appropriate comparison group may be difficult.
- Rates of disease in exposed and unexposed individuals cannot be determined

5 METHODOLOGY

5. MATERIALS AND METHODS

5.1 Study Setting

The city of Vellore is the administrative headquarters of Vellore district in the state of Tamil Nadu, South India. Vellore has four zones with a total of 60 wards, located on the banks of Palar River, in the north-eastern part of Tamil Nadu, covers an area of 87.915 square kilometer and has a population of 4, 81,996 based on 2011 census, with 239,735 males and 242,231 females (59). Vellore is an Urban Agglomeration (U/A) coming under category of Class I UAs/Towns, overseen by Municipal Corporation and is situated in the Urban region of Vellore.

The literacy rate of Vellore is 87.29% which is higher than National Urban average of 85%.

The childhood population percentage for 0-6 years is 9.35 % which is les compared to national average 10.93 %. This consists 22,889 male children and 22,160 female children(60).

The schools in Vellore are divided into Vellore division and Thirupathur division. There are 197 Higher Secondary schools in Vellore division. The Vellore division is divided into 10 blocks. Most schools are run by government or government aided.

5.2 Study design

Unmatched case control study.

5.3 Sample size

The study was powered to detect a three times greater odds of being depressed among those who are obese as compared to those not obese using a two sided Fishers exact test.

We assumed the prevalence of depression in adolescent population=12% based on a previous study from Ranchi.

Prevalence among controls (general population) – Pcontrol

To get odds ratio of 3,

$$\text{Prevalence among cases} = \frac{\text{OR (Pcontrol)}}{\text{1+ Pconrtol (OR-1)}}$$

$$= (3*0.12)/ [1+ (0.12*2)]$$

$$= 0.29$$

$\bar{p}$ = Weighted average prevalence of exposure

$$= (0.29+ 2*0.12)/3$$

$$= 0.17$$

$\bar{q} = (1- \bar{p}) = 1- 0.23 = 0.83$

$$n = \frac{\left(Z_{\propto}\sqrt{\left(\frac{c+1}{C}\right)\bar{p}\bar{q}} + Z_{B}\sqrt{p_1 q_1 + {p_0 q_0}/{C}}\right)^2}{(p_1 - p_o)^2}$$

c- number of times the control

Z_{α}= 1.96 (upper tail probability for 0.025)

Z_{β} = 0.8416 (upper tail probability for 20% - i.e. 80% power)

d = difference between Pcases and Pcontrols

= 0.29 – 0.12 = 0.1

= 63 cases and 126 controls

The prevalence of obesity among adolescents is estimated at 10%. In order to identify the requisite number of cases, assuming 20 % refusal to participate in the case control study, 750 participants required to be screened.

5.4 Definition of Cases and Controls

Case: Any student attending school who is between the age group 10 -15 years with a BMI of >= 85^{th} percentile and gave assent and parents gave consent to participate in the study.

Control: Any student attending school who is between the age group 10-15 years with a BMI of <85^{th} percentile and matched for age, gender and school and gave assent and parents gave consent to participate in the study.

5.5 Inclusion and Exclusion criteria

Inclusion criteria

- Adolescents between age group of 10-15years
- Attending schools in urban area of Vellore

Exclusion criteria

- Children with physical disability
- Children on chronic medication

5.6 Study period

July, August and September 2014

5.6 Selection of cases and controls

The permission to the conduct this study in high schools was obtained from District Educational Officer. The list of higher secondary schools was obtained from D.E.O office. Ten schools were chosen based on the convenience of the school administration and the investigator. Each school was approached and permission was sought from the school principal. As board exam were going on, most school principals did not give permission to include 10^{th} grade students into this study. Classes were chosen from 6^{th} to 9^{th} according to convenience of teachers. In each school children from 2 sections (80-100 students) were screened. All students from these sections underwent height and weight assessment.

Students' study serial number, age, height (in cms) and weight (in kg) were entered in Epi-data software. Using WHO-Anthroplus, the data was imported and Z-score and percentiles were calculated for BMI (age adjusted).

All students who had BMI percentile of 85% and above were considered as eligible to be selected as cases. From the same school, age and gender matched students (1:3) with BMI percentile <85 were selected as eligible controls. Among the eligible cases and controls, those who gave assent and parent's consent were included in this study.

Selected schools

The following schools were included in the study:

1. G.H.S (Government Higher Secondary School) Sholavaram

2. G.H.S Munjurpattu

3. G.H.S Pennathur

4. G.H.S Konavattam

5. Government Muslim Higher Secondary School

6. V.K.V.M Velapadi

7. N. Krishnasamy Mudaliyar H.S

8. Don Bosco H.S Vellore

9. Sri.Venkateswara HSS, Vellore

10. Voorhees H.S.S Vellore

5.7 Data collection

Data collection was done by self-administered questionnaires. The investigator explained how to fill the form and clarified their doubts. Questionnaires were made available in both English and Tamil. The self-administered questionnaires included the following

- General questionnaire to collect information on demographic characteristics,
- DASS 21 to assess depression, anxiety and stress and
- Social networking questionnaire

As students were in one class room, students were instructed not to discuss with their friends or to copy from the person sitting next.

5.8 Statistical analysis

Data was entered in Epi-data and exported in to SPSS version 16. Socio-demographic characters were categorized and frequency and percentage were calculated. DASS 21 responses were computed and total scores for depression, anxiety and stress were calculated as per the DASS 21 manual and individuals were classified as 'normal, mild, moderate, severe and extremely severe'

Bivariate analysis was done using Chi square test to examine association between categorical variables. Independent t test was done to compare means between two groups. After dichotomizing different variables, Univariate analysis was done to generate an odds ratio and 95% confidence interval to study the association between overweight and factors related to demographical characteristics, social networking

and psychological factors. Multivariate logistic regression analysis was performed to adjust for confounding.

With the prevalence of 12%, number needed to screen would be 734 adolescents (using the formula $4pq/d^2$ where p is 12% and relative precision of 20%).

6 Results and Analysis

6.1 Screening Among the total population

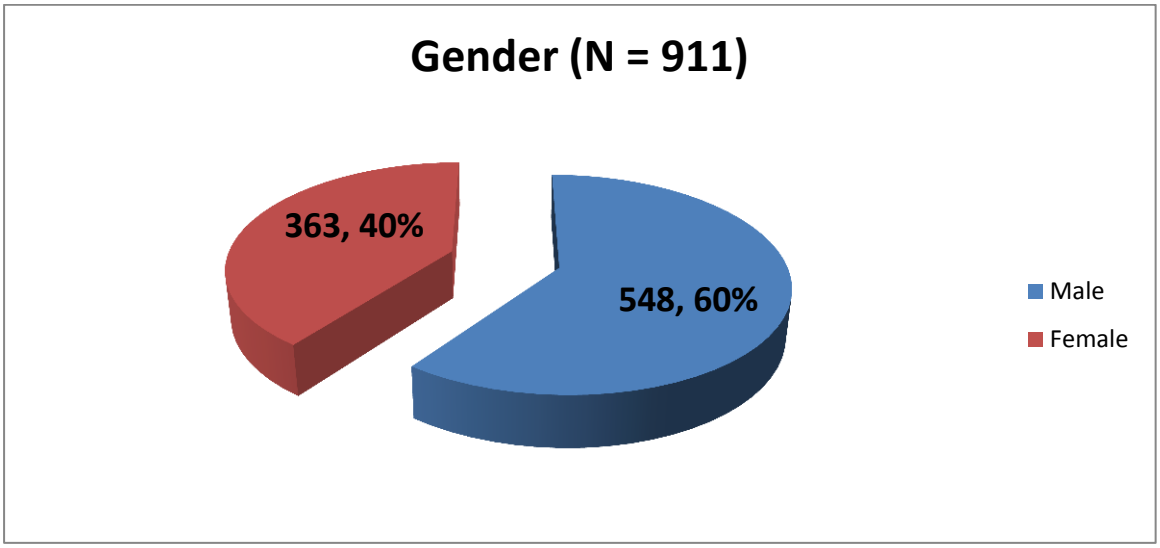
Age distribution of the screened students

Of the 911 students screened, majority, that is 311 (34.14%) were 13 years old. The minimum recorded age was 10 years and there were 14 (1.54%) children.

Gender distribution among the screened students

Total of 911 students were screened across 10 schools for overweight and obesity of whom, 548 (60%) were males and 363 (40%) were females.

Figure 3 : Gender distribution



Nutritional status of the screened students as per BMI-for-age (WHO classification)

In the screening we found that 115 children (12.6%) were overweight and 3 (0.3%) were obese. Among the 13 year olds, 39 (12.5%) were found to be over-weight while among the 11 year olds, 34 (13.4%) were found to be over-weight.

Figure 4: Nutritional status of the screened students as per BMI-for-age Z-score

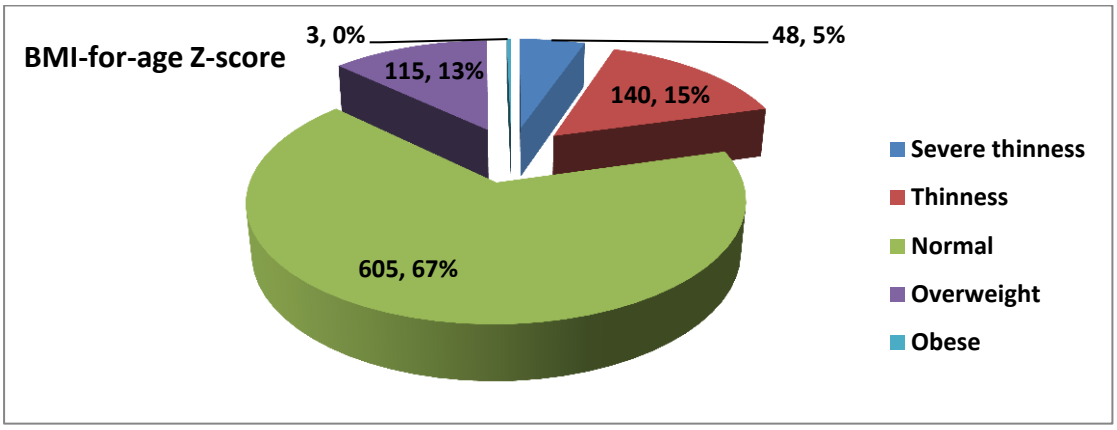
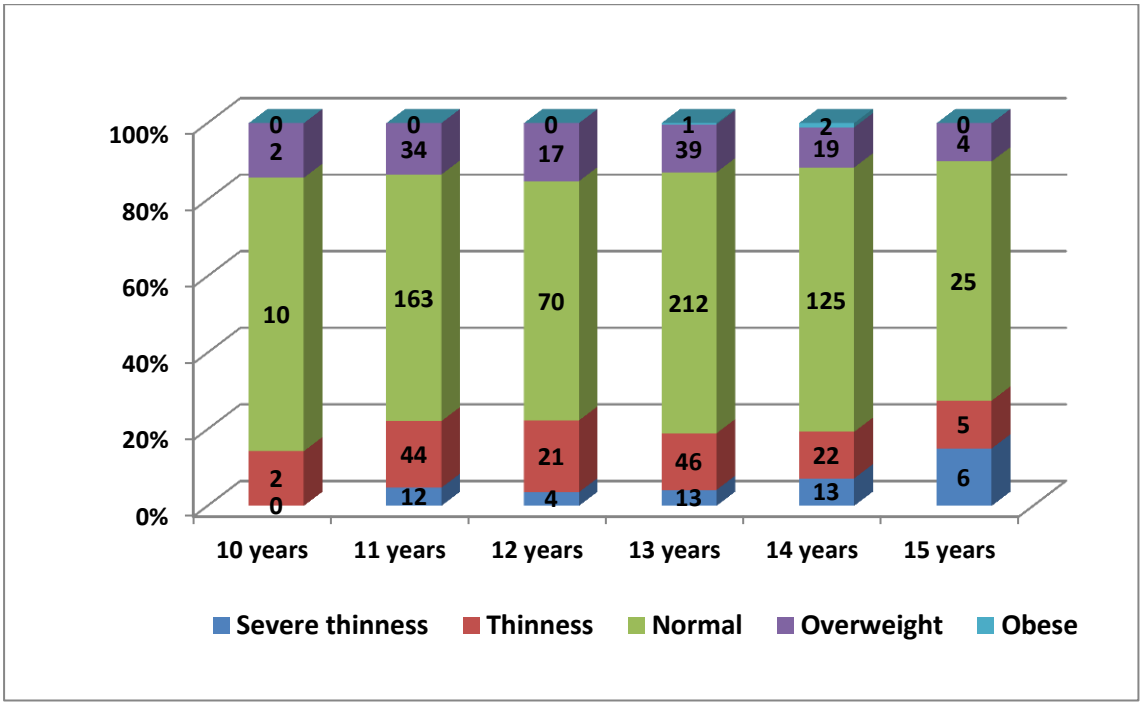


Figure 5: Nutritional status for different ages as per BMI-for-age (WHO classification)



Nutritional status for gender as per BMI-for-age (WHO classification)

The BMI-for-age Z-scores were compared with the gender of the student population. Among the 548 males, 80 (14.6%) were found to be over-weight and among the 363 females, 35 (9.6%) were over-weight. Among the males, 2 (0.4%) were obese and among the females, only one (0.3%) female was found to be obese.

Figure 6: Nutritional status for gender as per BMI-for-age (WHO classification)

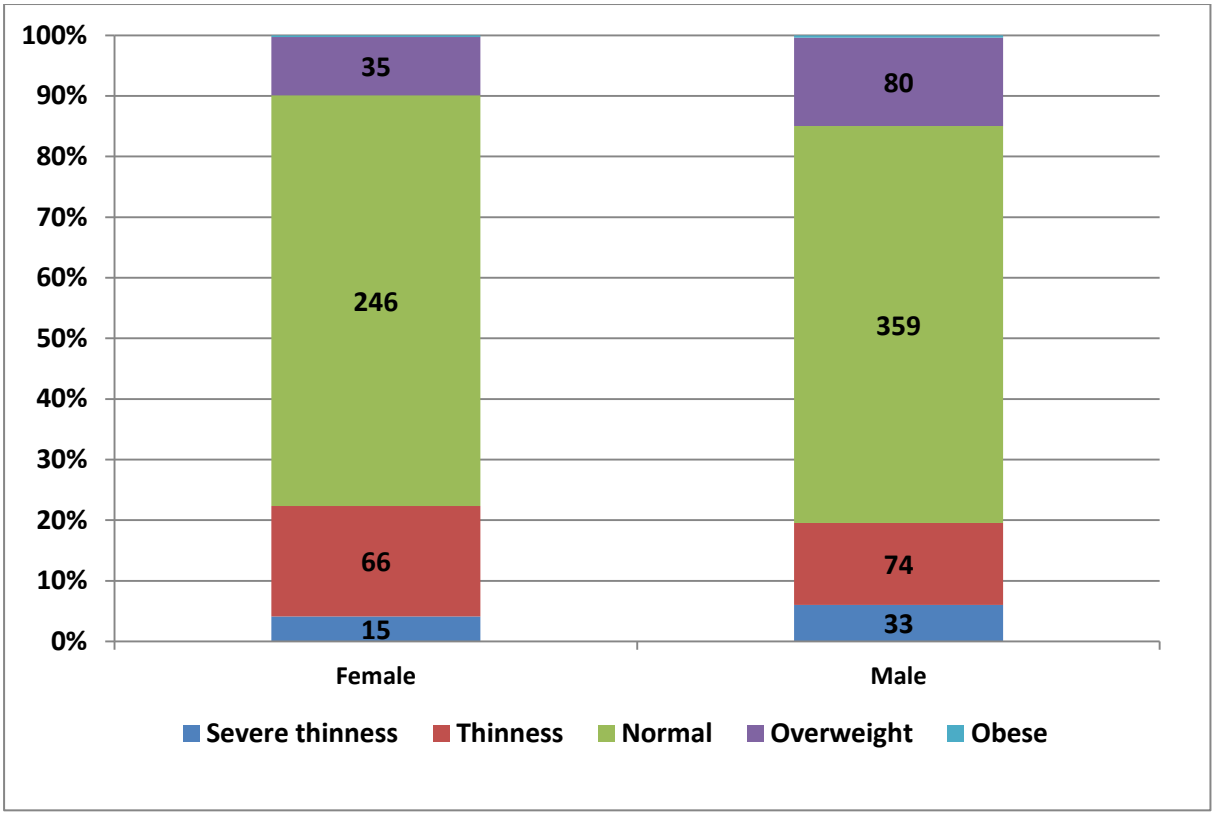


Figure 7 : Z-score distribution among females

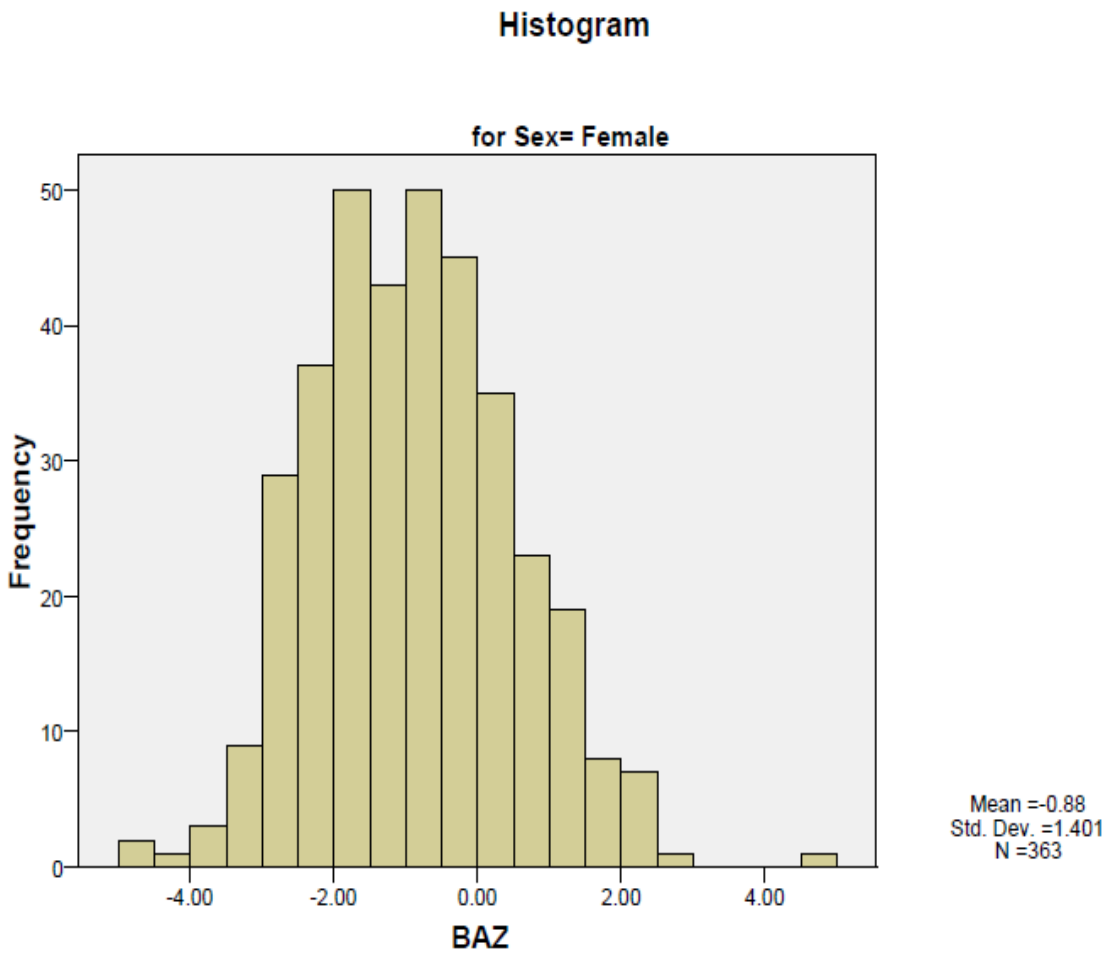


Figure 8: Z-score among Males

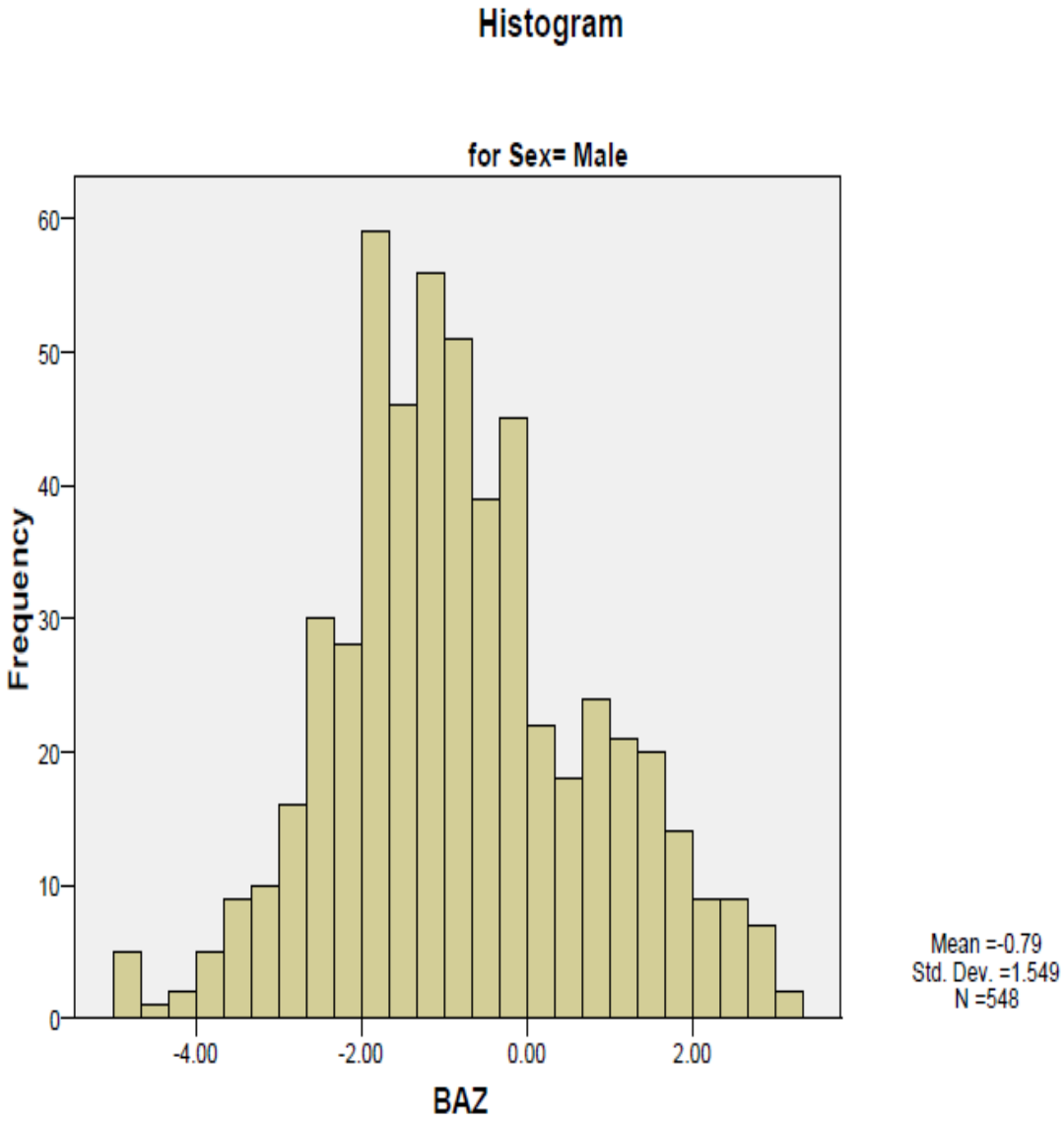
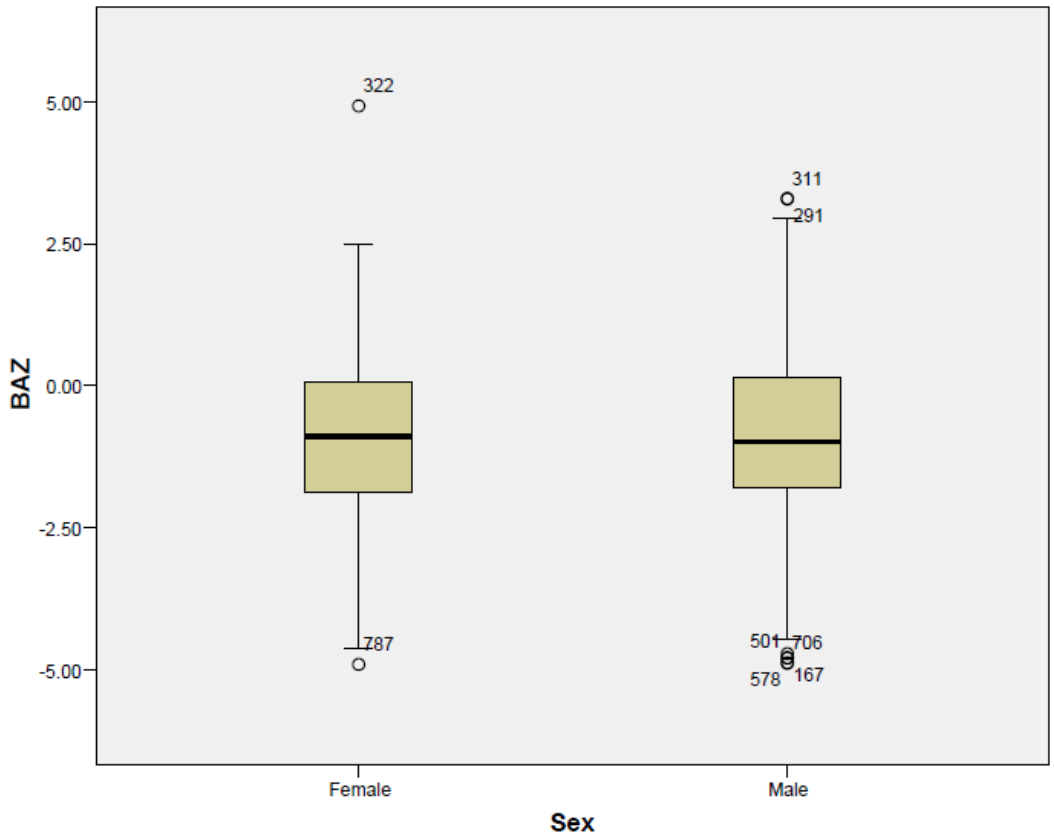


Figure 9: Box and Plot graph for BMI Z-score



6.2 Socio-demographic characteristics of the study population

Among the 200 study participants, the mean age among the cases was 12.67 years (SD = 1.07) and for the controls it was 12.79 years (SD = 0.99). There were 38 (69.1%) males and 17 (30.9%) females among the cases and there were 93 (64.1%) males and 52 (35.9%) females in the control group.

Majority were Hindus, 44 (80%) among the cases and 116 (80.0%) among the controls.

Among the cases, 23 (40%) attended government schools whereas the remaining 33 (60%) attended government aided schools. Among the controls, 56 (38.6%) attended government schools and 89 (61.4%) attended government aided schools.

Looking at the type of house the adolescents resided in, majority that is 41 (20.5%) resided in mixed type of houses both for the cases and the controls which was 24 (43.6%) and 75 (51.%) respectively. This was followed by 14 (25.5%) living in tiled houses followed by 11 (20.0%) living in terraced houses for the cases. Similarly there were 27 (18.5%) living in tiled houses followed by 32 (27.1%) living in terraced houses for the controls. There were more adolescents residing in tiled and terraced houses in the control group when compared to the cases. There were 6 (10.9%) cases and 11 (7.6%) controls residing in thatched houses, which was the least in frequency for both the groups.

Table 3: Socio-demographic characteristics of the study population

Variable	Category	Cases N=55 n (%)	Controls N=145 n (%)
Age (years)	11	8 (14.5%)	16 (11%)
	12	17 (30.9%)	38 (26.2%)
	13	17 (30.9%)	56 (38.6%)
	14	11 (20%)	31 (21.4%)
	15	2 (3.6%)	4 (2.8%)
Gender	Male	38 (69.1%)	93 (64.1%)
	Female	17 (30.9%)	52 (35.9%)
Religion	Hindu	44 (80.0%)	116(80.0%)
	Christian	2 (3.6%)	8 (5.5%)
	Muslims	9 (16.4%)	21 (14.5%)
Type of school	Government	22 (40.0%)	56 (38.6%)
	Government aided	33 (60.0%)	89 (61.4%)
Type of house	Thatched	6(10.9%)	11 (7.6%)
	Tiled	11 (20.0%)	32 (22.1%)
	Mixed	14(25.5%)	27 (18.6%)
	Terraced	24 (43.6%)	75 (51.7%)

Education

Majority of the mothers were educated up to high school both among the cases and the controls which was 30 (54.5%) and 62 (42.5%) respectively. There were more mothers who had attended high school among the controls than among the cases. The next highest numbers were seen in the primary school group which had 11 (20.0%) and 5 (3.4%) of cases and controls respectively. There was lesser number of mothers who had attended higher secondary school in the cases when compared to the controls which were 6 (10.9%) and 21 (14.5%) respectively. Though there were very few graduates both among the cases and controls, the numbers were more among the controls with only 1 (1.8%) among the cases and 3 (2.1%) among the controls. There were no uneducated mothers.

Among the fathers a similar pattern of education was observed with majority of the fathers having attended till high school with 22 (40.0%) among the cases and 60 (41.5%) among the controls. There were more fathers who had attended high schools among the cases than the controls. Again the next majority was among those who had attended up to primary school but here this was more for the cases when compared to the controls. There were lesser number of fathers who attended higher secondary among the cases when compared to the controls. There were no uneducated fathers among the cases but there was uneducated father among the controls.

Occupation, income and socioeconomic status

Majority of the mothers were housewives, there were more housewives in the controls than among the cases. This was 82 (56.6%) among the controls and 34 (61.8%) among the cases. There were more skilled as well as semi-skilled workers among the controls as compared to the cases.

There were more skilled as well as semi-skilled workers among the controls when compared to the cases. These were 45 (31.0%) among the controls and 16 (29.1%) among the cases who were semi-skilled workers and 41 (28.3%) and 17 (30.9%) in the skilled group for the controls and cases respectively.

Majority had a monthly household income ranging between INR 1601 to 4809. This range of income was more for the controls which was 72 (49.7%) when compared to 28 (50.9%) for the cases. The next highest income was for INR ranging from 4810 to 8009, again more for the controls, 33 (22.8%) for the controls when compared to the cases which was 12 (21.8%). 5 (9.1%) among the cases and 19 (13.1%) among the controls had incomes less than INR 1600. There were more numbers among the cases who had an income of less than INR 1600. Among the cases, majority that is 28 (50.4%) belonged to the lower-middle class whereas among the controls, majority, 79 (54.5%) belonged to the Upper-middle class. 1 (1.8%) and 7 (4.8%) belonged to upper-lower class among the cases and controls respectively.

Table 4: Occupation, income and socioeconomic status

Variable	Category	Cases N=55 n (%)	Controls N=145 n (%)
Mother's occupation	Professional	0 (0%)	4 (2.8%)
	Semi-professional	1 (1.8%)	0 (0%)
	Clerical, shop-owner	2 (3.6%)	4 (2.8%)
	Skilled worker	3 (5.5%)	7 (4.8%)
	Semi-skilled worker	2 (3.6%)	16 (11%)
	Unskilled worker	13 (23.6%)	32 (22.1%)
	House-wife	34 (61.8%)	82 (56.6%)
Father's occupation	Professional	2 (3.6%)	11 (7.6%)
	Semi-professional	1 (1.8%)	4 (2.8%)
	Clerical, shop-owner	7 (2.7%)	13 (9%)
	Skilled worker	17 (30.9%)	41 (28.3%)
	Semi-skilled worker	16 (29.1%)	45 (31%)
	Unskilled worker	12 (21.8%)	31 (21.4%)
Monthly Income (Rs.)	upto 1600	5 (9.1%)	19 (13.1%)
	1601 – 4809	28 (50.9%)	72 (49.7%)
	4810 – 8009	12 (21.8%)	33 (22.8%)
	8010 -12019	7 (12.7%)	15 (10.3%)
	12020 – 16019	2 (3.6%)	3 (2.1%)
	16020 - 32049	1 (1.8%)	3 (2.1%)
Socio-economic status	Upper middle	26 (47.3%)	79 (54.5%)
	Lower middle	28 (50.9%)	59 (40.7%)
	Upper lower	1 (1.8%)	7 (4.8%)

Physical activity among cases and controls

Majority of the children reached their schools by walk and there were more controls (22, 40.0%) than cases (82. 56.6%) who walked to school. The next major mode used to reach school among the adolescents was bicycle, again used more by the controls (22, 40.0%) than the cases (82, 56.6%). The other modes of transport used were two wheelers, school bus and bus. 137 (67.3%) cases and 102 (70.3%) of the controls visited the playground. There were more members among the controls who visited the playground when compared to the cases. The mean time spent in front of the television was 2.1 hours (SD = 1.8 hours) and 1.87 hours (1.4 hours) by cases and controls respectively. Among the cases, 29 (52.7%) adolescents spent more than 2 hours in front of the television in comparison to 69 (47.6%) of the controls. More adolescents among the controls spent more than 2 hours in front of the television. Nearly half the children in both the group spent less than 2 hours watching television.

Table 5: Physical activity among cases and controls

Variable	Category	Cases N=55 n (%)	Controls N=145 n (%)
Transport to school	Walking	22 (40.0%)	82 (56.6%)
	Cycling	15 (27.3%)	27 (18.6%)
	Two-wheeler	5 (9.1%)	11 (7.6%)
	School Bus	2 (3.6%)	1 (0.7%)
	Transport Bus	1 (1.8%)	5 (3.4%)
	Other	10 (18.2%)	19 (13.1%)
Going to playground	Yes	137 (67.3%)	102 (70.3%)
	No	18 (32.7%)	43 (29.7%)
Watching TV	2 hours or more	29 (52.7%)	69 (47.6%)
	Less than 2 hours	26 (47.3%)	76 (52.4%)

Eating Habits

32 (58.2%) of the adolescents among the cases when compared to 62 (42.8%) of the controls consumed snacks from outside. 5 (9.1%) of the cases and 13 (9.0%) of the controls consumed burgers. 19 (34.5%) of the cases and 41 (28.3%) of the controls consumed puffs, 38 (30.9%) of the cases and 33 (22.8%) of the controls consumed pakodas and 6 (10.9%) of the cases and 14 (9.1%) of the controls consumed pastries. 30 (54.5%) of the cases and 54 (37.2%) of the cases took high calorie snacks.

Social Networking

In the time spent in leisure activity, majority, 16 (29.1%) of the cases spent their leisure time by eating outside when compared to 39 (26.1%) of the controls. 26 (17.9%) of the controls played outdoor games when compared to 7 (12.7%) of the cases. 18 (32.7%) of the cases never spent time for ant sort of leisure activity when compares to 45 (31.0%) of the controls. The main mode of interaction among the adolescents were by visiting each other which was 36 (65.5%) when compared to 113 (77.9%) among the controls. This was followed by majority of them in the cases, 17 (30.9%) using cell phone to interact with friends when compared to 22 (15.2%) of controls.

Table 6: Social Networking

Variable	Category	Cases N=55 n (%)	Controls N=145 n (%)
Leisure time activity	No leisure time activity	18 (32.7%)	45 (31%)
	Playing video games	7 (2.7%)	20 (13.8%)
	Eat out	16 (29.1%)	39 (26.9%)
	Indoor games	1 (1.8%)	7 (4.8%)
	Sit around and chat	6 (10.9%)	8 (5.5%)
	Outdoor games	7 (12.7%)	26 (17.9%)
Mode of interaction with friends	Physically visiting them	36 (65.5%)	113 (77.9%)
	Through facebook	1 (1.8%)	5 (3.4%)
	Through cell phone	17 (30.9%)	22 (15.2%)
	Others	1 (1.8%)	5 (3.4%)

Friends

The number of friends who were obese for the study participants were compared among the cases and controls. Of the 55 cases, 16 adolescents (29.1%) among cases had at least 2 obese friends when compared to 43 (29.7%) among the controls. Among the cases 7 (12.7%) had at least 3 obese friends when compared to 27 (18.6%) of the controls.

Table 7: Categorization of Obese Friends

Variable	Category	Cases N=55 n (%)	Controls N=145 n (%)
Number of obese/overweight friends	< 3 friends	41 (74.5%)	96 (66.2%)
	3 and above	14 (25.9%)	49 (33.8%)

Mental Health Status by DASS-21 among Cases and Controls

Among the 55 cases, 12 (22.2%) had moderate depression when compared to 28 (19.6%) of the controls. Moderate anxiety was present among 5 (9.3%) of the cases when compared to 27 (18.9%) of the controls. Moderate stress was seen 5 (9.3%) among the cases when compared to 16 (11.2%) of the controls.

Table 8: Mental Health Status by DASS-21 among Cases and Controls

Variable	Category	Cases N=55 n (%)	Controls N=145 n (%)
Depression	No depression	33 (61.1%)	78 (54.5%)
	Mild depression	5 (9.3%)	25 (17.5%)
	Moderate depression	12 (22.2%)	28 (19.6%)
	Severe depression	2 (3.7%)	9 (6.3%)
	Extreme severe depression	2 (3.7%)	3 (2.1%)
Anxiety	No anxiety	28 (51.9%)	66 (46.2%)
	Mild anxiety	5 (9.3%)	19 (13.3%)
	Moderate anxiety	5 (9.3%)	27 (18.9%)
	Severe anxiety	8 (18.8%)	12 (8.4%)
	Extreme severe anxiety	8 (14.8%)	19 (13.3%)
Stress	No stress	42 (77.8%)	107 (74.8%)
	Mild stress	3 (5.6%)	14 (9.8%)
	Moderate stress	5 (9.3%)	16 (11.2%)
	Severe stress	4 (7.4%)	6 (4.2%)
	Extreme severe anxiety	0 (0%)	0 (0%)

6.3 BIVARIATE ANALYSIS

A total of 200 participants were recruited in the study. Among them 55 participants had BMI for age percentile more than 85 (cases) and 145 participants had less than 85th percentile.

AGE

Table 9: Age distribution among cases and controls

Age	Cases n (%)	Controls n (%)	Total n (%)
11 to 12 years	25 (45.5)	54 (37.2)	79 (39.5)
13 to 15 years	30 (54.5)	91 (62.8)	121 (60.5)
Total	55	145	200

Chi sq. = 0.43 p –value = 0.51 OR (95% CI) = 0.8 (0.41 – 1.56)

Among the 200 participants majority (60.5%) were 13 to 15 years of age. Nearly 45% (25/55) of the cases were 11 to 12 years of age as compared to 37% (79/200) of the controls. There was no statistically significant association between the participants belonging to this age group and overweight / obesity

SEX

Table 10: Gender distribution among cases and controls

Gender	Cases n (%)	Controls n (%)	Total n (%)
Female	17 (30.9)	52 (35.9)	69 (34.5)
Male	38 (69.1)	93 (64.1)	131 (65.5)
Total	55	145	200

Chi sq. = 0.43 p –value = 0.51 OR (95% CI) = 1.25 (0.64 – 2.43)

Of the 55 cases and 145 controls, majority of them, i.e., 31% (17/55) of the females were cases as compared to 36% (54/145) of the controls. The remaining 66 % of the participants were. The difference in proportion between boys and girls was not statistically significant (p-value 0.511).

RELIGION

Table 11: Distribution of Religion among cases and controls

Religion	Cases n (%)	Controls n (%)	Total n (%)
Hindu	44 (80)	116 (80)	160 (80)
Muslim/Christian	11 (20)	29 (20)	40 (20)
Total	55	145	200

Chi sq. = 0 p –value = 1 OR (95% CI) = 1 (0.46 – 2.17)

Majority of the participants (80%) belonged to the Hindu religion. The distribution of religion was the same among cases and controls in this study population. There was no statistically significant association between religion and overweight/obesity.

TYPE OF SCHOOL

Table 12: Distribution of type of school among cases and controls

School	Cases n (%)	Controls n (%)	Total n (%)
Government	22 (40)	56 (38.6)	78 (39)
Government aided	33 (60)	89 (61.4)	122 (61)
Total	55	145	200

Chi sq. = 0.032 p –value = 0.86 OR (95% CI) = 1.06 (0.56 – 1.99)

Among the 200 participants majority of the students (61%) attended Government aided school. Forty per cent (22/55) of the cases attended Government schools as compared to 39% (56/145) of the controls. There was no statistically significant association between the type of school the participant attended and overweight/obesity.

TYPE OF ROOF

Forty three per cent (24/55) of the cases lived in houses with concrete roofs as compared to 51% (74/145) of the controls. There was no statistically significant association between the type of roof and overweight/obesity.

Figure 11: Type of roof among cases

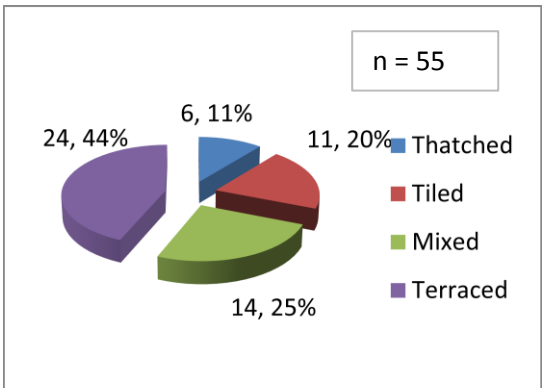
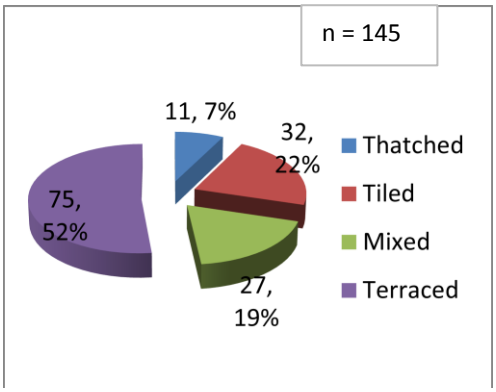


Figure 10: Type of roof among controls



Chi sq. = 0.873 p –value = 0.35 OR (95% CI) = 0.743 (0.398 – 1.387)

MOTHERS EDUCATION

Table 13: Distribution of mother's education among cases and controls

Mothers Education	Cases n (%)	Controls n (%)	Total n (%)
Middle school and below	18 (32.7)	59 (40.7)	77 (38.5)
High school and above	37 (67.3)	86 (59.3)	123 (61.5)
Total	55	145	200

Chi sq. = 1.068 p –value = 0.301 OR (95% CI) = 0.709 (0.369 – 1.363)

Among the 200 participants, 32% (18/55) of the cases had mothers who have studied up to middle school as compared to 38.5% (77/200) of the controls. The remaining 61% of the participant mothers had studied at least up o high school. There was no association between mothers education and overweight/obesity.

MOTHERS OCCUPATION

Table 14: Distribution mother's occupation among cases and controls

Mothers Occupation	Cases n (%)	Controls n (%)	Total n (%)
Unemployed	34 (61.8)	82 (56.6)	116 (58)
Semiskilled and above	21 (38.2)	63 (43.4)	84 (42)
Total	55	145	200

Chi sq. = 0.454 p –value = 0.5 OR (95% CI) = 1.244 (0.659 – 2.348)

Among the 200 participants, nearly 62% (34/55) of the cases had mothers who were unemployed as compared to 39.3% (57/145) of the controls. The remaining 42% of the participant mothers were employed. Even though the percentage of mothers who were unemployed were higher among cases, there was no statistically significant association between mother's education and overweight/obesity.

Among the 200 participants, nearly 22% (12/55) of the cases had fathers who were working in an unskilled occupation as compared to 21.4% (43/145) of the controls. The remaining 78.5% of the participant fathers were employed in other occupations. Even though the percentage of fathers who were employed in an unskilled occupation were higher among cases, there was no statistically significant association between mothers education and overweight/obesity.

MONTHLY INCOME OF THE FAMILY

Figure 12: Monthly income

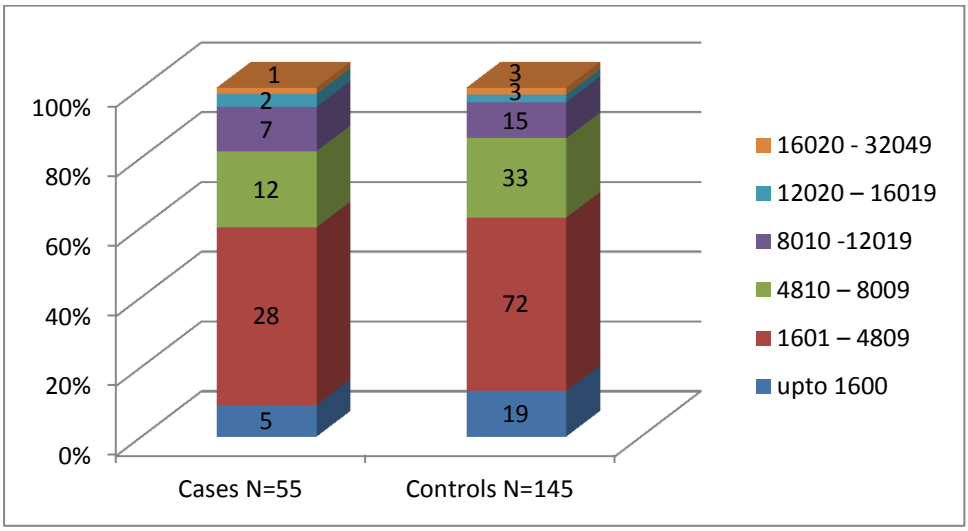


Table 15 : Income

Income (rupees)	Cases n (%)	Controls n (%)	Total n (%)
>3000	27 (49.1)	69 (47.6)	96 (48)
<=3000	28 (50.9)	76 (52.4)	104 (52)
Total	55	145	200

Chi sq. = 0.036 p –value = 0.849 OR (95% CI) = 1.062 (0.571 – 1.976)

The median of controls was used to dichotomized the data to test for association in the univariate analysis of this variable. Forty nine per cent (27/55) of the cases lived with families earning more than 3000 rupees per month as compared to 48% of the controls. Even though the percentage of mothers who were unemployed was higher among cases, there was no statistically significant association between participants living with families earning more than 3000 rupees per month and overweight/obesity.

SOCIO ECONOMIC STATUS

Figure 13 : Socio-economic status

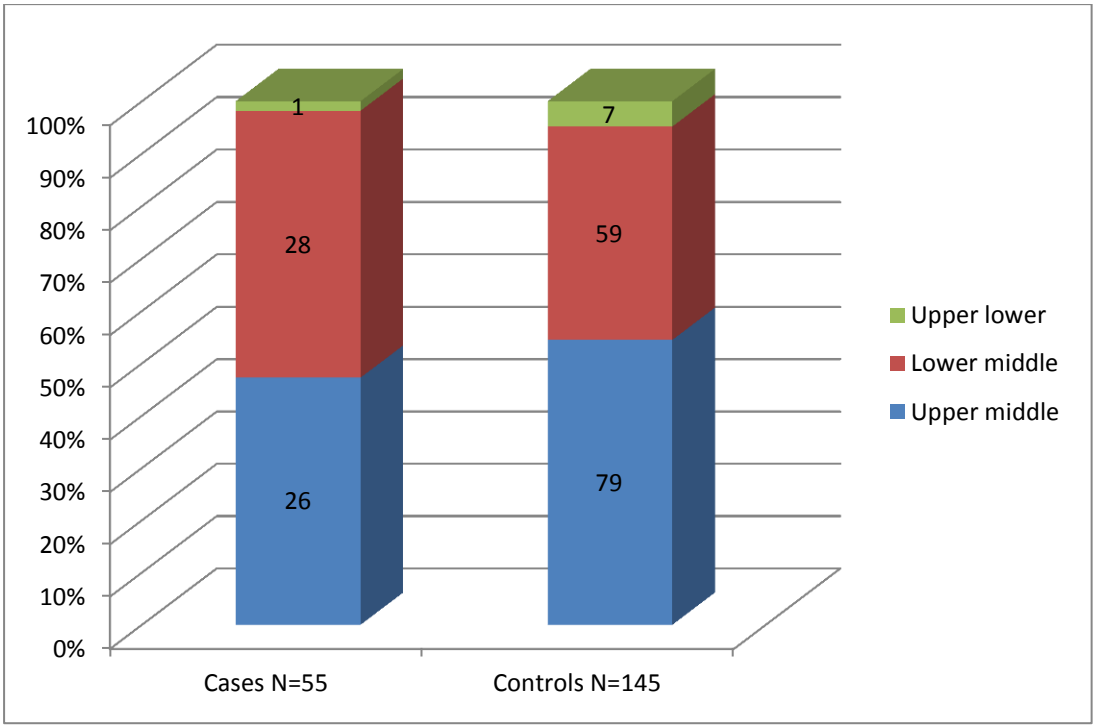


Table 16: Socio-economic status

Socio-economic status	Cases n (%)	Controls n (%)	Total n (%)
Upper lower and lower middle	29 (52.7)	66 (45.5)	95 (47.5)
Upper middle	26 (47.3)	79 (54.5)	105 (52.5)
Total	55	145	200

Chi sq. = 0.831 p –value = 0.362 OR (95% CI) = 1.335 (0.717 – 2.487)

Nearly 52% (29/55) of the cases belonged to the upper lower and lower middle socio economic status as compared to 45.5% (66/145) of the controls. Even though the percentage of cases belonging to the upper lower and lower middle socio economic status were higher, there was no statistically significant association between socio economic status and overweight/obesity.

MODE OF TRANSPORT

Table 17: Mode of Transport

Transport	Cases n (%)	Controls n (%)	Total n (%)
All other modes of transport	33(60)	63 (43.4)	96 (48)
Walking and cycling	22 (40)	82 (56.6)	104 (52)
Total	55	145	200

Chi sq. = 4.377 p –value = 0.036 OR (95% CI) = 1.952 (1.038 – 3.671)

Among all the overweight and obese adolescents, only 40% resorted to walking as a mode of transport as compared to 56 .6% of non-obese adolescents. Three fifths of the cases travelled in some form of motorized vehicle. This observed difference was found to be statistically significant (p-value = 0.036) with an OR (95% CI) of 1.952 (1.038 – 3.671).

PHYSICAL ACTIVITY

Table 18: Physical activity

Playground	Cases n (%)	Controls n (%)	Total n (%)
Does not play in playground	18 (32.7)	43 (29.7)	61 (30.5)
Plays in playground	37 (67.3)	102 (70.3)	139 (69.5)
Total	55	145	200

Chi sq. = 0.178 p –value = 0.673 OR (95% CI) = 1.154 (0.593 – 2.247)

Majority of the participants, 67.3% of cases and 70.3% of controls were used to play in playground. Only 32.7% of the cases and 29.7% of the controls do not play in playground and this was not statistically significant (p-value 0.673)

Watching TV

Figure 14: Distribution of watching TV

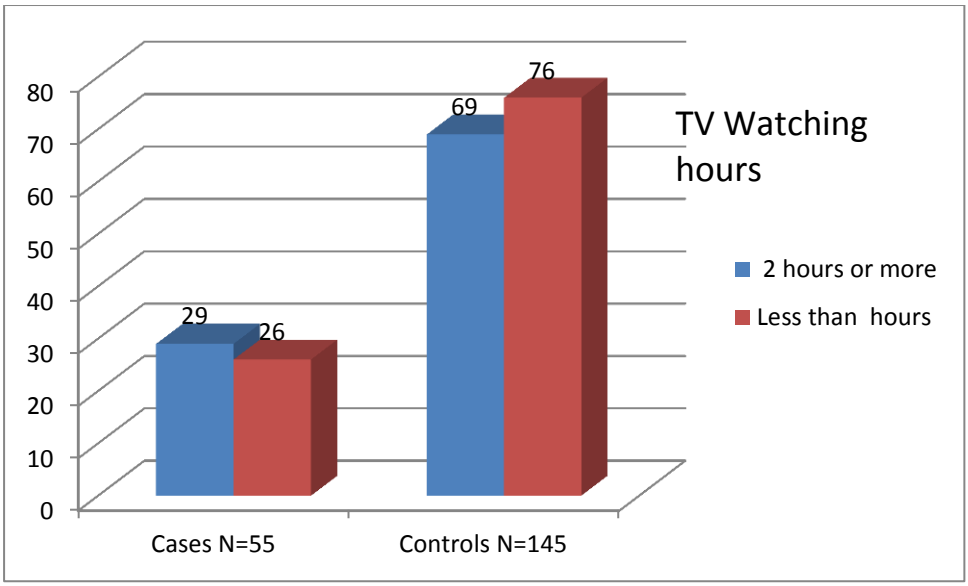


Table 19: Distribution of watching TV among cases and controls

Watching TV	Cases n (%)	Controls n (%)	Total n (%)
2 hours or more	29 (52.7)	69 (47.6)	98 (49)
Less than or equal to one hour	26 (47.3)	76 (52.4)	102 (51)
Total	55	145	200

Chi sq. = 0.422 p –value = 0.516 OR (95% CI) = 1.229 (0.66 – 2.288)

Of the study participants, 52.7% of the cases and 47.6% of the controls were watching TV for 2 hours and more. There was no association between the obesity and the watching TV (p-value 0.516).

Leisure time activities

Figure 15: distribution of Leisure time activities

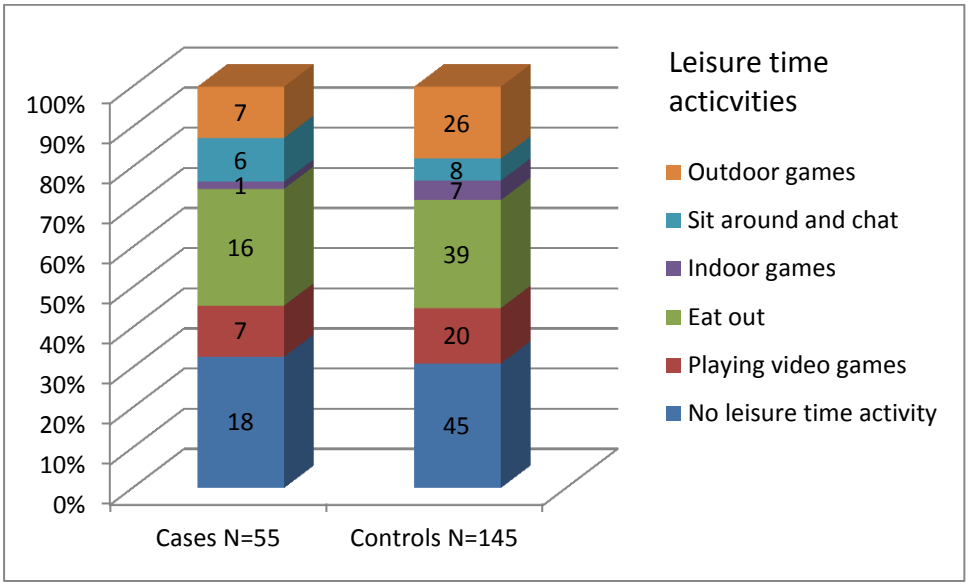


Table 20: Distribution of leisure time activities among cases and controls

Leisure time activities	Cases n (%)	Controls n (%)	Total n (%)
Other activities	48 (87.3)	119 (82.1)	167 (83.5)
Outdoor games	7 (12.7)	26 (17.9)	33 (16.5)
Total	55	145	200

Chi sq. = 0.784 p –value = 0.376 OR (95% CI) = 1.498 (0.61 – 3.683)

Among the study participants, 87.3% of the cases and 82.1% of the controls did not have physical activity with friends. The association between obesity and physical activity with friends was not statistically significant (p-value 0.376).

Mode of Interaction with friends

Figure 16: Mode of interaction with friends

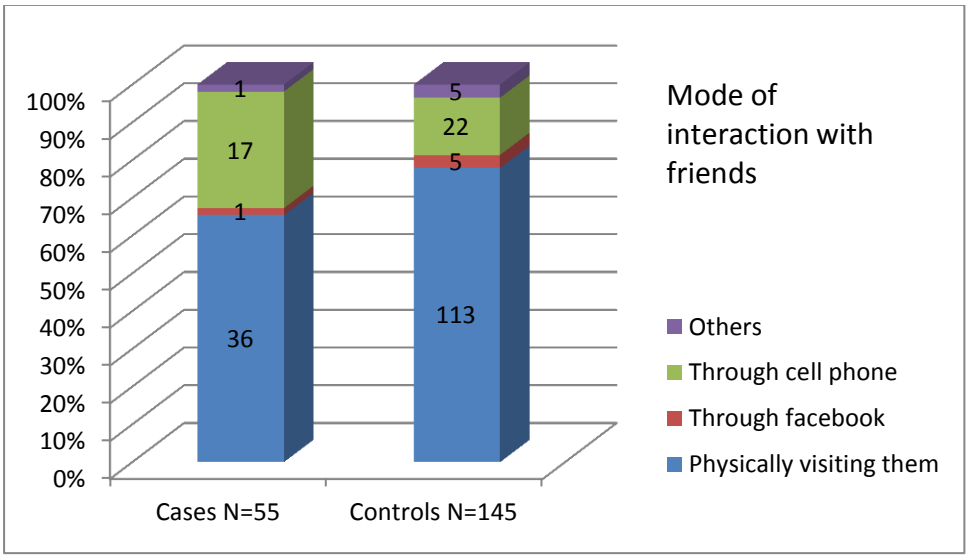


Figure 17: Mode of interaction with friends

Touch with Friends	Cases n (%)	Controls n (%)	Total n (%)
Facebook ,phone calls	20 (36.4)	32 (22.1)	52 (26)
Physically meet up	35 (63.6)	113 (77.9)	148 (74)
Total	55	145	200

Chi sq. = 4.235 p –value = 0.04 OR (95% CI) = 2.018 (1.027 – 3.964)

Among the study participants, 63.6% of the cases and 77.9% of the controls physically meet up their friends. Among the overweight and obese adolescents, 36.4% used facebook / phone calls to be in touch with their friends as compared to 22.1% of the non-obese adolescents. There was a statistically significant association between

obesity and the mode of keeping in touch with their friends with an odds ratio of 2.018 (95%CI: 1.03-3.96).

Snacks consumed

Of the study population, 58.2% of the cases and 42.8% of the controls had the habit of eating snack outside. The association between eating snack outside and obesity is statistically significant though the confidence interval includes 1. Among the participants, 54.5% of cases and 37.2% of controls had any one high calorie food such as Burger, Pastries, Puff and Pakoda. There was a significant association between the obesity and the high calorie food with the odds ratio of 2.02 (95% CI: 1.08-3.79).

Number of Obese Friends

Table 21: Number of obese friends

Obese friends	Cases n (%)	Controls n (%)	Total n (%)
0-2 obese friends	41 (74.5)	96 (66.2)	137 (68.5)
3 or more obese friends	14 (25.5)	49 (33.8)	63 (31.5)
Total	55	145	200

Chi sq. = 1.285 p –value = 0.257 OR (95% CI) = 1.495 (0.744 – 3.003)

Majority of the cases (74.5%) and controls (66.2%) had 1 or 2 obese friends. The association between obesity and obese friends was not statistically significant (p-value 0.257).

Psychological Risk Factors

a. Depression

Figure 18: depression among cases and controls

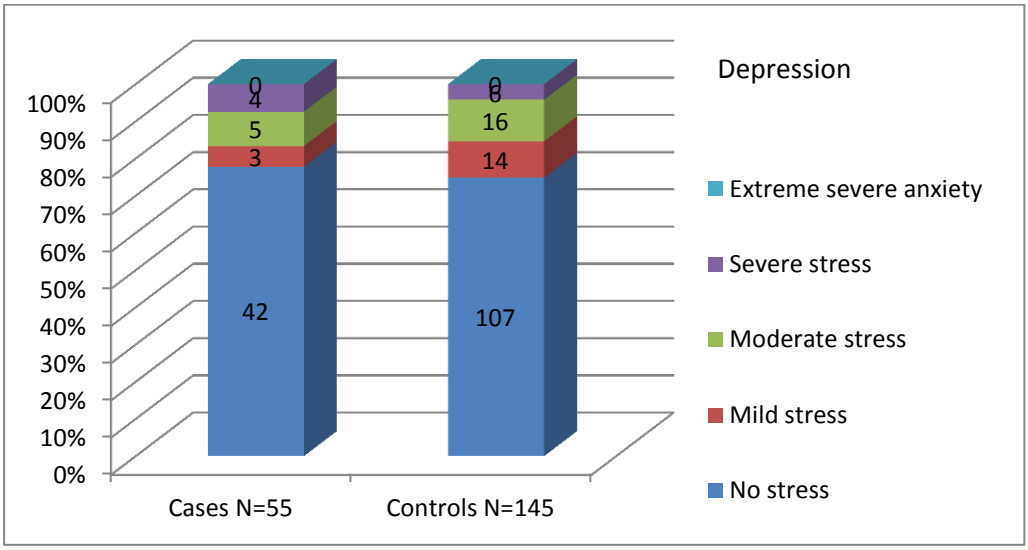


Table 22: Depression among cases and controls

Depression	Cases n (%)	Controls n (%)	Total n (%)
Clinically depressed	16 (29.6)	40 (28)	56 (28.4)
Normal	38 (70.4)	103 (72)	141 (71.6)
Total	54	143	197

Chi sq. = 0.053 p –value = 0.818 OR (95% CI) = 1.084 (0.544 – 2.159)

b. Anxiety

Figure 19: Anxiety among cases and controls

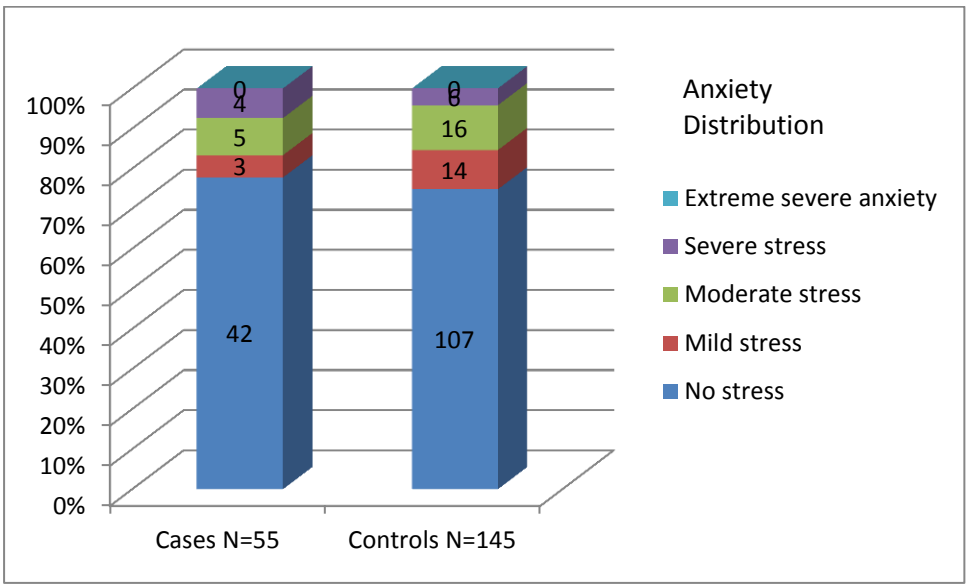


Table 23: Anxiety among cases and controls

Anxiety	Cases n (%)	Controls n (%)	Total n (%)
Clinically Anxious	21 (38.9)	58 (40.6)	79 (40.1)
Normal	33 (61.1)	85 (59.4)	118 (59.9)
Total	54	143	197

Chi sq. = 0.046 p –value = 0.046 OR (95% CI) = 0.933 (0.491 – 1.77)

c. Stress

Figure 20: Stress among cases and controls

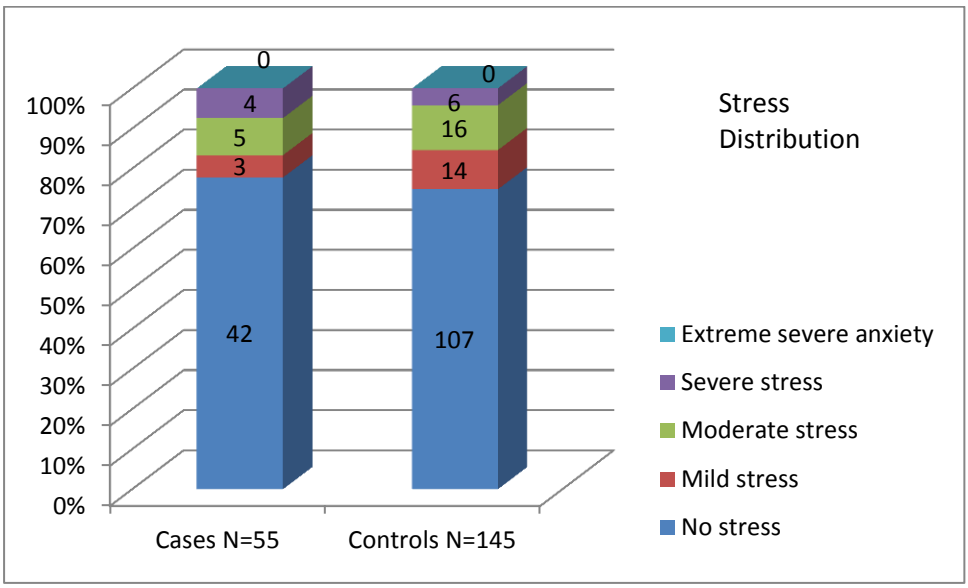


Table 24: Stress among cases and controls

Stressed	Cases n (%)	Controls n (%)	Total n (%)
Clinically stressed	9 (16.7)	22 (15.4)	31 (15.7)
Normal	45 (83.3)	121 (84.6)	166 (84.3)
Total	54	143	197

Chi sq. = 0.049 p –value = 0.826 OR (95% CI) = 1.1 (0.471 – 2.568)

Among the study participants, 29.6% of the cases and 28% of the controls were found to be clinically depressed. There was no significant association between depression and the obesity (p-value 0.818). About 38.9% of the cases and 40.6% of the controls were clinically anxious and there was no statistical significance (p-value 0.831). Of the study participants, 16.7% of the cases and 15.4% of controls were clinically

stressed. There was no significant association between depression and the obesity (p-value 0.826).

SUMMARY OF BIVARIATE ANALYSES

Table 25: Summary of Bivariate tables

Variable	Risk Factor	Cases n (%)	Controls n (%)	p-value	OR (Unadjusted)	95% CI	
						lower	upper
Gender	Female	17 (30.9)	52 (35.9)	0.51	1.25	0.64	2.43
Age	11 to 12 years	25 (45.5)	54 (37.2)	0.51	0.8	0.41	1.56
Religion	Hindu	44 (80)	116 (80)	1	1	0.46	2.173
Income(Rs.)	>3000	27 (49.1)	69 (47.6)	0.85	1.06	0.57	1.98
Socio economic status	Upper lower and lower middle	29 (52.7)	66 (45.5)	0.36	1.34	0.72	2.49
Mothers Education	Middle school and below	18 (32.7)	59 (40.7)	0.3	0.71	0.37	1.36
Mothers Occupation	Unemployed	34 (61.8)	82 (56.6)	0.5	1.24	0.66	2.35
Fathers Education	Middle school and below	27 (49.1)	57 (39.3)	0.21	1.49	0.8	2.78
Fathers Occupation	Unskilled	12 (21.8)	31 (21.4)	0.95	1.03	0.48	2.18
Type of house	Terraced	24 (43.6)	74 (51)	0.35	0.74	0.4	1.39
Type of School	Government	22 (40)	56 (38.6)	0.86	1.06	0.56	2

Variable	Risk Factor	Cases n (%)	Controls n (%)	p-value	OR (Unadjusted)	95% CI	
						lower	upper
Social networking	Facebook, phone calls	20 (36.4)	32 (22.1)	0.04*	2.02	1.03	3.96
Transport	all other modes of transport	18 (32.7)	36 (24.8)	0.26	1.47	0.75	2.9
Transport - walking	All other modes/cycling	33(60)	63 (43.4)	**0.036***	**1.95**	1.04	3.67
Playground	does not play in playground	18 (32.7)	43 (29.7)	0.67	1.15	0.59	2.25
Watching TV	2 hours or more	29 (52.7)	69 (47.6)	0.52	1.23	0.66	2.29
Leisure time activities	Other activities	48 (87.3)	119 (82.1)	0.38	1.5	0.61	3.68
Physical activity	No physical activity with friends	48 (87.3)	119 (82.1)	0.38	1.5	0.61	3
Obese friends	0-2 obese friends	41 (74.5)	96 (66.2)	0.26	1.5	0.74	3
Food habits	Snacking outside	32 (58.2)	62 (42.8)	0.05	1.86	0.99	3.49
Burger	Yes	5 (9.1)	13 (9)	0.98	1.02	0.34	3
Pastries	Yes	6 (10.9)	14 (9.7)	0.79	1.15	0.42	3.15
Puff	Yes	19 (34.5)	41 (28.3)	0.39	1.34	0.69	2.6
Pakoda	Yes	17 (30.9)	33 (22.8)	0.24	1.52	0.76	3.03
Any high calorie food	Yes	30 (54.5)	54 (37.2)	0.027*	2.02	1.08	3.79
Depression	Clinically depressed	16 (29.6)	40 (28)	0.82	1.08	0.54	2.16
Anxiety	Clinically Anxious	21 (38.9)	58 (40.6)	0.83	0.93	0.49	1.77
Stressed	Clinically stressed	9 (16.7)	22 (15.4)	0.83	1.10	0.47	2.57

6.4 Multivariate Analyses

To adjust for potential confounders, selected variables which were strongly established risk factors from this and other studies were chosen from the univariate analyses for multivariate analyses. A logistic regression analysis was performed to study the risk factors, associated with overweight and obesity. The following variables were used as exposure variables : Any high calorie food, social networking to keep in touch with friends like face book, motorized transport; lower socio-economic status, age of the participant from 11 – 12 years, clinical depression, clinical anxiety and clinical stress. This model's statistics are presented in the table below.

Table 26: Multivariate analysis

Multivariate analysis								
Variable	Risk factor	OR (unadjusted)	95% C.I (unadjusted)		p-value	OR (adjusted)	95% C.I (adjusted)	
			Lower	Upper			Lower	Upper
Any high calorie food	Yes	2.02	1.08	3.79	0.014	2.38	1.189	4.764
Social networking	facebook, phonecalls	2.02	1.03	3.96	0.159	1.661	0.82	3.366
Transport	Motorized mode	1.47	0.75	2.9	0.188	1.621	0.79	3.325
Socio economic status	Upper lower and lower middle	1.34	0.72	2.49	0.147	1.641	0.841	3.202
Age	11 to 12 years	0.8	0.41	1.56	0.216	1.526	0.781	2.981
Depression	Clinically depressed	1.08	0.54	2.16	0.82	1.11	0.451	2.729
Anxiety	Clinically Anxious	0.93	0.49	1.77	0.755	0.877	0.386	1.993
Stressed	Clinically stressed	1.10	0.47	2.57	0.977	1.016	0.362	2.847

In this regression model, participants eating high calorie food were found to be independently significant with overweight and obesity after adjusting for confounding factors.

7 Discussion

In this study, we screened 911 school students across various schools of Vellore. The study participants were between the age group of 10 -15 years belonging to the sixth to tenth grade. The prevalence of overweight and obesity in the population screened was found to be 12.6 % and 0.3% respectively. The results were comparable to a meta –analysis of nine studies done by Gedam, showed a prevalence of childhood obesity to be 12.64% (95 % Confidence interval 8.48% - 16.80%) (16).

The mean weight of females in the population screened was 33.8 kilograms (95% confidence interval 32.85 -34.762), with a standard deviation of 9.49 kilograms. Similarly among the males who were screened, the mean weight was 36.73 kilograms (95% confidence interval 35.797-37.668) with a standard deviation of 11.14 kilograms. A study done by Dasgupta et al, in urban slums of Kolkata among 10 to 19 year old adolescents, 47.93% were malnourished according to Body Mass Index (BMI) (62). However, in our study only 20% of the screened adolescents were thin or severely thin as per the WHO cut offs for Z scores of Body Mass Index (BMI) of weight for age. The difference observed could have risen due to the difference in the study population.

Risk factors for obesity

In our study after screening, 9.9% of the female participants were overweight and obese and 15% of the male participants were overweight and obese.

Shyamala et al in their study of 5 districts of Tamil Nadu reported 29% obesity among boys and 32% obesity among girls (25). However it should be noted that the age group of the participants was 12 – 17 years and the CDC cutoffs were used to classify the participants' BMI. Results comparable to our study was observed by Kotian et al in South Karnataka, where among 12 – 15 year old adolescents, 9.3% of the boys were obese and 10.5% of the girls were obese as per the Body Mass Index (BMI) (20).

Lower mothers and fathers education

Alvira et al in their study on parental education and frequency of food consumption observed that lower level of education among parents is a risk factor for obesity. The reason being high sugar and high fat food consumption was more among 2-9 year old children whose parents have low to medium level of education (64). In our study, most of the mothers studied till high school (46%) in the overall study population. Among the cases 18 (32.7%) had mothers who had an education of middle school and below. Among the controls 66 (45.5%) had mothers who had an education of middle school and below. Lower education of the mother of the students was not found to be a risk factor for overweight and obesity in this study.

Lower socioeconomic status

The schools selected for the study were Government or Government aided schools and hence the adolescents studying in these are expected to belong to similar socio-economic status. In our study, among the cases, 29 (52.7%)

belonged to lower socioeconomic status. Among the controls, 66 (45.5%) belonged to lower socio-economic status. Lim in his paper on association between socio-economic status and childhood obesity concludes that, in developing countries the high socio-economic status population who consume high calorie diets are more at risk for obesity (32). However in our study, there was no significant association between obesity and overweight and socio-economic status of the study population.

Physical activity

In a systematic review of 27 articles on Active Travel to School (ATS) and Health-related fitness, it was observed that there is some evidence to suggest that ATS is associated with healthy body composition (33). In our study 18 (32.7%) of the cases and 54 (27%) preferred methods of transport other than walking to school. It was observed that among those who use any mode of transport other than walking, there was 1.47 times risk of being obese as compared to those who walk to school. After adjusting for confounders, mode of transport to school other than walking was not found to be associated with obesity- Adjusted odds ratio 1.661 (95% Confidence interval 0.82 – 3.366) with a p value 0.159.

Going to playground to paly

A national study done in the United States among children showed that there was a significant relationship between the availability of parks and playgrounds and its relationship between obesity. This study also showed that the availability

of parks and playgrounds decreased the prevalence of obesity in children (34). In our study, 18 (32.7) of the cases and 36 (24.8) of the students didn't go to play ground for playing. However, there was no significant relationship between adolescents going to playground to play and obesity (p value 0.67), Unadjusted odds ratio 1.15 (95% Confidence interval 0.59 – 2.25).

Time spent in television

In the present years, decrease in physical activity among the adolescents is contributed to increased time spent in watching television, playing video games and using internet (65).

Crespo et al in their Third National health and Nutritional examination survey in the United States reported that prevalence of obesity was least among children who watch one or less than one hour of television in a day. Watching television was associated with obesity, after controlling for other factors (66). In our study, the minimum number of hours spent on watching television in a day was half an hour and the maximum number of hours spent on watching television was eight. The mean hours of watching television in a day among cases was 2.1 hours with a mean of 2.1 and standard deviation of 1.8. The mean hours of watching television in a day, among controls was 1.8 and standard deviation was 1.4. However, there was no significant association between hours of watching television in a day and obesity, unadjusted odds ratio being 1.22, (95% Confidence interval 0.66 – 2.28) and p value 0.51.

Social Networking

The reason why obesity clusters in network is because the way they choose their friends. It was also found even after controlling for the friend selecting process, a significant link is found between student's weight and friends circle. Among the cases 32 (58.2%) children among the cases and 62 (42.8 %) children among the controls snacked outside school. There was no significant association between obesity and the cases who snack outside the school. Some high calorie foods which adolescents eat outside school were burger, pastries , puff and chicken pakoda. Among the cases, the Consumption of any one of these high calorie snacks was observed among 30 (54.5%) and among the controls it was observed among 54 (37.2%) and this difference was found to be statistically significant (p value = 0.027) with an odds of 2.02 (95% Confidence interval 1.08 – 3.79) times becoming obese on consumption of high calorie snack.

The study participants were given a stunkards body image mapping and asked to identify 5 of their friends on how their body image would look like. It is a rough estimate of the number of obese friends for an adolescent. Among the cases 41 (74.5%) had 2 or less than 2 obese friends and among the controls 96 (66.2%) had 2 or less than 2 obese friends and this difference was not found to be statistically significant (p value 0.26) and odds ratio was 1.5 (95% confidence interval 0.14 – 3.00).

In a study done in Ranchi among young adults, depressive symptoms were present among 18.5% of the study population, anxiety symptoms were present among 24.4% and stress among 20% of the population. However, clinical depression was found among 12.1% and generalized anxiety was present among 19% of the young adults in the study (67).

In our study 29.6% of the cases and 28% of the controls were clinically depressed. However, this difference was not found to be statistically significant. Among the cases, 38.9% and among the controls 40.6% had anxiety. This difference was also not found to be statistically significant. Among the cases 16.7% and among the controls 15.4% were stressed during the time of interview. This difference was also not found to be statistically significant.

8 SUMMARY AND CONCLUSIONS

Overweight and obesity among adolescents has been on the rise globally over the years. Those who are obese during childhood continue to do so when they grow into adulthood. As early onset obesity has significant later life risk of non-communicable disease, there are likely to be substantial health benefits to the children in identifying those at risk of childhood obesity and intervening early .This rise is attributed because of unhealthy eating habits and lack of physical activity .

- This study was done in schools of Vellore.
- The age groups that were chosen were was from 10-15 years in the classes sixth to tenth.
- The prevalence of overweight and obesity in the population screened was found to be 12.6 % and 0.3% respectively. The nutritional status of children of the BMI for age ranges from severe thinness to obese .The percentage of people with severe thinness was 5.3 % normal was 66.4 % over weight was 12.6 %and obese was 0.3%.

- The risk factors we looked into were categorized as social, psychological and behavioral. There was no statistically significant association found between gender, education of the parents and socioeconomic status.
- The psychological factors that where looked into were, depression, anxiety and stress. These risk factors were not found to be associated with obesity.
- There was a significant association between eating a high calorie snack like chicken pakoda, puffs and pastry and being overweight or obese.
- Children who used any mode of transport to school other than walking were at risk for obesity as compared to those who use other modes of transport.
- The onset of digital and mobile communications appears to be associated with overweight and obesity. On the other hand, being physically active and meeting up to play outdoors tends to protect children from obesity.

9 RECOMMENDATIONS

Health education regarding obesity, which is an emerging problem among adolescents and its future complications, could be included in school health education programs.

The importance of healthy diet and avoiding high calorie snacks should be taught to the students at early age itself.

Training of teachers on identification of obesity and depression among adolescents and further counseling to the adolescents and their parents could be implemented.

Physical activity and sports should be made a part of the curriculum compulsorily.

10 LIMITATIONS

- The required sample size could not be achieved due to difficulties in gaining permission from the schools during field visits and parental consent.
- The dietary details were not assessed in detail for this study.
- The lack of privacy during the administration of the questionnaire and the time allotted by each school for this study were important limiting factors in this study.

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12 Annexures

Annexure 1:

ASSENT FORM English

ASSENT

ID PROFORMA NO:

Christian Medical College, Vellore
Department of community health
IDENTIFYING RISK FACTORS OF OBESITY IN ADOLESCENT SCHOOL CHILDREN

Information sheet

You are being requested to participate in the above titled research study. The purpose of the study is to explore the risks of obesity in adolescent school students studying from 6th to 10th standard.

Young people are under constant stress. Whether studies or at home it can affect the performance of the student and impede him/ her from reaching the full potential .Stress can manifest itself in the form of depression, unhealthy eating and lack of physical exercise . Stress if persistent for a long time can cause diseases like obesity, high blood pressure and heart attack. Research has also shown that people who are obese while young continue to be so through their adult hood .so it is essential to identify the risk factors in the adolescent population as early as possible to prevent the occurrence of these diseases and intervene at the right time.

If you take part what will you have to do?

If you agree to participate, your participation will involve the measuring of your height and weight. Once that is done you will be administered questionnaires for filling .It consists of filling of five questionnaires. Four of them will be filled by you and one will be filled by the interviewer by the responses that you give. Listed below are the names of five questionnaires and respective time it will take to complete.

1. General information-5 minutes

2. Social networking – 5 minutes

3.DASS-depression anxiety stress scale -10 minutes

4.IPAQ- International physical activity questionnaire -5 minutes.

5. 24 hour dietary recall- will take 15 minutes (asked by the interviewer)

.

Can you withdraw from this study after it starts?

Your participation in this study is entirely voluntary and you are also free to decide to withdraw permission to participate in this study. If you do so, this will not affect the study.

Are there any risks involved in taking part in the study?

There are no known risks or costs involved by your participation in the study.

Are there any benefits by taking part in the study?

There are no monitory benefits by taking part in this study.

Will we have to pay to take part in the study?

No money will be collected for taking part in the study.

What happens after the study is over?

. Once the study is over, the data obtained will be analysed and according to the study results interventions will be done and also the results will be used for studies and further research purposes.

Will your personal details be kept confidential?

The results of this study will be published in a medical journal but you will not be identified by name in any publication or presentation of results. However, the information you provide may be reviewed by people associated with the study, without your additional permission, should you decide to participate in this study.

If at the end of filling questionnaires you have doubts regarding the study or any further questions , please ask Dr.DIVYA .VS (mobile number:9600833643) or email: docdivya.vs @gmail.com

Study Title: TO DETERMINE THE BEHAVIORAL AND PSYCHOLOGICAL RISK FACTORS OF OBESITY IN ADOLESCENTS

:

I_____
_____, son/daughter of _____

(Please tick boxes)
Declare that I have read the information sheet provide to me regarding this study and have clarified any doubts that I had. [ ]
I also understand that my participation in this study is entirely voluntary and that I am free to withdraw permission to continue to participate at any time.

I understand that the study staff and institutional ethics committee members will not need my permission to look at the information I give as a part of this study. I agree to this access [ ]
I understand that my identity will not be revealed in any information released to third parties or published [ ]
I voluntarily agree to take part in this study [ ]

Name:
Signature: date:
Date:

Annexure 2

Assent form – tamil

அடையாள படிவ எண் சம்மதப்படிவம்

கிறித்துவ மருத்துவக் கல்லூரி, வேலூர் சமூக சுகாதாரத் துறை

வளர் இளம் பருவ பள்ளி குழந்தைகளிடையே அதீத பருமனுக்கான அபாய காரணிகளை அடையாளம் காணுதல்

தகவல் படிவம்

நீங்கள் மேலே குறிக்கப்பட்டுள்ள ஆய்வில் பங்கேற்க அழைக்கப்பட்டுள்ளீர். இந்த ஆய்வின் நோக்கம் 6ஆம் வகுப்பு முதல் 10ஆம் வகுப்பு வரை படிக்கும் வளர் இளம் பள்ளி மாணவரிடையே அதீத பருமனால் ஏற்படும் அபாயங்களை கண்டறிதல்

வளர் இளம் பருவத்தினர் ஓயாத அழுத்தத்திற்கு ஆளாகின்றனர். கல்வி சார்ந்த அல்லது தனிப்பட்ட அழுத்தங்கள் மாணவர்களின் செயல்திறனைக் குறைத்து அவர்கள் தங்களது முழுத்திறமையை வெளிப்படுத்துவதைத் தடை செய்கிறது. மனப்பதட்டம், ஆரோக்கியமற்ற உணவு முறைகள், உடற்பயிற்சி இல்லாமை ஆகியவை அழுத்தத்தின் வெளிப்பாடுகளாகும். தொடர்ச்சியான நீண்ட கால அழுத்தம் காரணமாக அதீத பருமன், இர்த்த அழுத்தம், இருதய நோய் போன்ற அபாயங்கள் நேரிட வாய்ப்புள்ளது. வளர் இளம் பருவத்தில் அதீத பருமனாக இருப்பவர் வயது முதிர்ந்த பின்னரும் அவ்வாறே இருப்பதாக ஆய்வுகள் கூறுகின்றன. எனவே வளர் இளம் பருவத்தினரிடையே இத்தகைய அபாய காரணிகளைக் கூடிய விரைவில் கண்டறிந்து மேற்கூறிய நோய்கள் நேராது சரியான நேரத்தில் தடுப்பது மிகவும் அவசியம்.

நீங்கள் இதில் பங்கேற்றால் என்ன செய்யவேண்டும்?

நீங்கள் இதில் பங்கேற்றால் உங்களது உயரமும் எடையும் அளக்கப்படும். அதன் பின்னர் உங்களுக்கு அளிக்கப்படும் வினாப்பட்டியலைப் பூர்த்தி செய்ய வேண்டும். நீங்கள் ஐந்து வினாப்பட்டியல்களைப் பூர்த்தி செய்யவேண்டும். நான்கு நீங்களே பூர்த்தி செய்யவேண்டும். ஒன்று மட்டும் உங்களைப் பேட்டி காண்பவர் நீங்கள் தரும் பதிலுக்கேற்ப பூர்த்தி

செய்வார்.வினாப்பட்டியல்களின் தலைப்பும் அவற்றைப் பூர்த்தி செய்ய தேவைப்படும் நேரமும் கீழே பட்டியலிடப்பட்டுள்ளது.

1.பொதுத் தகவல்கள் - 5 நிமிடங்கள்

2.சமூகப் பிணையங்கள் - 5 நிமிடங்கள்

3.டாஸ் - மனத்தளர்வு, மன உளைச்சல், மன அழுத்த அளவுகோல் - 10 நிமிடங்கள்

4.ஐபிஏகுயு - அகில தேசிய உடற்பயிற்சி வினாப்பட்டியல் - 5 நிமிடங்கள்

5.24மணி நேரத்தில் உண்ட உணவுகளை பின்னோக்கிப்பார்த்தல் (பேட்டி காண்பவர் கேட்பார்) - 15 நிமிடங்கள்

நீங்கள் ஆய்வு ஆரம்பித்தபின் அதிலிருந்து வெளியேற முடியுமா?

நீங்கள் இந்த ஆய்வில் பங்கேற்பது முற்றிலும் தன்னிச்சையானது. எனவே ஆய்விலிருந்து வெளியேற நீங்களே தீர்மானம் எடுக்கலாம். நீங்கள் வெளியேறுவதால் ஆய்வு எந்த விதத்திலும் பாதிக்கபடாது.

இந்த ஆய்வில் பங்கேற்பதால் ஏதேனும் அபாயங்கள் உள்ளதா?

இந்த ஆய்வில் பங்கேற்பதால் எந்த அபாயமும் அல்லது செல்வினமோ இல்லை.

இந்த ஆய்வில் பங்கேற்பதில் ஏதேனும் ஆதாயம் உள்ளதா?

எந்த பொருளாதார ஆதாயமும் இல்லை.

நாங்கள் இந்த ஆய்வில் பங்கேற்க ஏதேனும் பணம் செலுத்த வேண்டுமா?

இந்த ஆய்வில் பங்குபெற எந்த பணமும் வாங்கப்படமாட்டாது.

ஆய்வு முடிந்தபின் என்ன நடக்கும்?

ஆய்வு முடிந்தபின் சேகரிக்கப்பட்ட தகவல்கள் பகுப்பாய்வு செய்யப்படும். அவை தரும் முடிவுகளுக்கேற்ப தகுந்த முன்னெச்சரிக்கை நடவடிக்கைகள் எடுக்கப்படும். மேலும் இந்த முடிவுகள் மேற்படிப்பிற்காகவும், ஆராய்ச்சிகளுக்காகவும் பயன்படுத்தப்படும்.

உங்களது தனிப்பட்ட தகவல்கள் அந்தரங்கமாக வைக்கப்படுமா?

இந்த ஆய்வின் முடிவுகள் மருத்துவ செய்தித் தாளில் வெளியிடப்படும். ஆனால் உங்கள் பெயர் எந்த வெளியீட்டிலும் வராது. நீங்கள் இந்த ஆய்வில் பங்கேற்றால் நீங்கள் தரும் தகவல்கள் உங்கள் மறு அனுமதியின்றி இந்த ஆய்வில் தொடர்புடைய ஆய்வாளர்களால் மீண்டும் பரிசீலிக்கப்படும்.

நீங்கள் வினாப்பட்டியலைப் பூர்த்தி செய்தபின் இந்த ஆய்வைக் குறித்து ஏதேனும் சந்தேகங்கள் இருந்தால் அல்லது மேலும் கேள்விகள் கேட்க விரும்பினால் டா. திவ்யா வி. எஸ். அவர்களைக் கேட்கலாம். (கைப்பேசி எண் 9600833643 அல்லது இணைய தள முகவரி டாக்திவ்யா.விஎஸ்@ ஜிமெயில்.காம்)

ஆய்வின் தலைப்பு : வளர் இளம் பருவத்தினரிடையே அதீத பருமன் காரணமாக ஏற்படக்கூடிய நடத்தை மற்றும் மனவியல் சம்பந்தமான அபாய காரணிகளை கண்டறிதல்

நான்

உடைய மகன் / மகள்_____

(தயவுசெய்து கீழ்கண்ட வினாக்களுக்கு உங்கள் விடையை குறியிட்டுக் காட்டவும்)

நான் இந்த ஆய்வைக் குறித்து எனக்கு தரப்பட்ட தகவல் படிவத்தைப் படித்து என் சந்தேகங்களைத் தெளிவு படுத்திக் கொண்டு விட்டேன். ( )

நான் இந்த ஆய்வில் பங்கேற்பது முற்றிலும் தன்னிச்சையானது என்றும் நான் எப்போது வேண்டுமானாலும் என் அனுமதியைத் திரும்பப் பெற இயலும் என்றும் தெரிந்துகொண்டேன். ( )

நான் இந்த ஆய்விற்கு அளிக்கும் தகவல்களை என் அனுமதியின்றி ஆய்வுக்குழுவினர் மற்றும் நிறுவனத்தின் நன்னெறிக்குழுவினர் பார்க்க நான் ஒப்புக்கொள்கிறேன். ( )

என்னுடையஅடையாளம் எந்த வெளி நபருக்கோ அல்லது வெளியீடுகளிலோ வெளிப்படுத்தப்படாது என்பதை அறிந்து கொண்டேன். ( )

நான் தன்னிச்சையாக இந்த ஆய்வில் பங்கேற்க ஒப்புதல் அளிக்கிறேன்.

பெயர் :

கையொப்பம்:

தேதி :

Annexure 3:

Consent form- English

ID PROFORMA NO:

Christian Medical College, Vellore Department of community health

IDENTIFYING RISK FACTORS OF OBESITY IN ADOLESCENT SCHOOL CHILDREN

Information sheet

respected sir/madam

Your ward has been requested to participate in the above titled research study. The purpose of the study is to explore the risks of obesity in adolescent school students studying from 6^{th} to 10^{th} standard.(age group 10-15 years)

Adolescent population is under constant stress. Whether academic or personal it can affect the performance of the student and impede him/ her from reaching the full potential .Stress can manifest itself in the form of depression, unhealthy eating and lack of physical exercise . Stress if persistent for a long time can pose the risk of life style modifying diseases like obesity, hypertension and coronary artery disease. Research has also shown that people who are obese as adolescent continue to be so through their adult hood .so it is essential to identify the risk factors in the adolescent population as early as possible to prevent the occurrence of these diseases and intervene at the right time

If you take part what will you have to do?

If you consent your ward to participate, his/her participation will involve the measuring of their height and weight. Once that is done they will be administered questionnaires for filling .It consists of filling of five questionnaires. Four of them will be filled by him/her and one will be filled by the interviewer by the responses that he/she gives. Listed below are the names of five questionnaires and the respective time it will take to complete.

1. General information-5 minutes

2. Social networking – 5 minutes

3. DASS-depression anxiety stress scale -10 minutes

4. IPAQ- International physical activity questionnaire -5 minutes.

5. 24 hour dietary recall- will take 15 minutes (asked by the interviewer)

Can your ward withdraw from this study after it starts?

Your ward's participation in this study is entirely voluntary and he/she are also free to decide to withdraw permission to participate in this study.

Are there any risks involved in taking part in the study?

There are no known risks or costs involved by your participation in the study.

Are there any benefits by taking part in the study?

There are no monetary benefits by taking part in this study

Will we have to pay to take part in the study?

No money will be collected for taking part in the study

What happens after the study is over?

Once the study is over, the data obtained will be analysed and according to the study results interventions will be done and also the results will be used for studies and further research purposes.

Will your personal details be kept confidential?

The results of this study will be published in a medical journal but your ward will not be identified by name in any publication or presentation of results. However, the information your ward provides may be reviewed by people associated with the study, without your additional permission, should your ward decide to participate in this study.

If you have any further questions, please ask Dr.DIVYA .VS (mobile number:9600833643) or email: docdivya.vs @gmail.com

CONSENT FORM

Study Title: TO DETERMINE THE BEHAVIORAL AND PSYCHOLOGICAL RISK FACTORS OF OBESITY IN ADOLESCENTS

I_____

_____, father/mother/guardian of

_____

(Please tick boxes)

Declare that I have read the information sheet provide to me regarding this study and have clarified any doubts that I had. [ ]

I also understand that my ward's participation in this study is entirely voluntary and that he/she is free to withdraw permission to continue to participate at any time.

I understand that the study staff and institutional ethics committee members will not need my permission to look at the information my ward gives as a part of this study. I agree to this access [ ]

I understand that my ward's identity will not be revealed in any information released to third parties or published [ ]

I voluntarily agree for my ward to take part in this study [ ]

Name:

Signature

Date:

Annexure 4 consent form-tamil

அடையாள படிவ எண் :

ஒப்புதல் படிவம்

கிறித்துவ மருத்துவ கல்லூரி, வேலூர்

சமூக சுகாதாரத் துறை

ஆய்வின் பெயர் : வளர் இளம் பருவத்தினரிடையே அதீத பருமன் காரணமாக ஏற்படக்கூடிய நட்த்தை மற்றும் மனவியல் சம்பந்தமான அபாய காரணிகளை கண்டறிதல்

உடைய தகப்பனார் / தாயார் / பாதுகாவலர்

(தயவுசெய்து கீழ்கண்ட வினாக்களுக்கு உங்கள் விடையை குறியிட்டுக் காட்டவும்)

நான் இந்த ஆய்வை குறித்து எனக்கு தரப்பட்ட தகவல் படிவத்தைப் படித்து என் சந்தேகங்களைத் தெளிவு படுத்திக் கொண்டு விட்டேன் ( )

என் குழந்தை இந்த ஆய்வில் பங்கேற்பது முற்றிலும் தன்னிச்சையானது என்றும் நான் எப்பொழுது வேண்டுமானாலும் என் அனுமதியைத் திரும்பப் பெற இயலும் என்றும் தெரிந்துகொண்டேன் ( )

என் குழந்தை இந்த ஆய்விற்கு அளிக்கும் தகவல்களை என் அனுமதியின்றி ஆய்வுக்குழுவினர் மற்றும் நிருவனத்தின் நன்னெறிக்குழுவினர் பார்க்க நான் ஒப்புக்கொள்கிறேன் ( )

என் குழந்தையின் அடையாளம் எந்த வெளி நபருக்கோ அல்லது வெளியீடுகளிலோ வெளிப்படுத்தப்படாது என்பதை அறிந்து கொண்டேன்( )

நான் தன்னிச்சையாக என் குழந்தை இந்த ஆய்வில் பங்கேற்க ஒப்புதல் அளிக்கிறேன்.

பெயர் :

கையொப்பம் :

தேதி :

Annexure 5: General proforma English

Proforma ID number

GENERAL QUESTIONNAIRE

1. Age (in years)

2. Sex: Male Female

3. Father's education: _____

4. Mother's education: _____

5.Father's occupation: _____

6. Mother's occupation:_____

7. Highest education in family:_____

8.Highest occupation in family:_____

10. Religion: _____

11. Name of the school: _____

12. Type of the house you are currently living choose from the options provided

1) Thatched

2) Terraced

3) Tiled

4) Mixed

13. Do you go to the playground to play: Yes No

14. How many hours do you spent in front of the computer or television daily? _____ Hours

15. How do you usually go to school? Choose one option

Mode of transport	Tick the most appropriate answer
Walking	
Cycling	
Two wheeler	
Car	
School bus	
Transport bus	

Others specify-

16. Do you have any long standing disease? Yes No

If yes _____

Annexure 6: General proforma - Tamil

மாதிரிப் படிவ அடையாள எண் :

பொதுவான கேள்வி பட்டியல்

1.வயது :

2.பாலினம் : | ஆண் | பெண் |

3.தகப்பனாரின் கல்வித்தகுதி : _____

4.தாயாரின் கல்வித்தகுதி : _____

5.தகப்பனாரின் பணி : _____

6.தாயாரின் பணி : _____

7.குடும்பத்தின் அதிகப்பட்ச வருமானம் : _____

8.குடும்பத்தின் அதிகப்பட்சப் பணி : _____

9.மதம் : _____

10.படித்த பள்ளியின் பெயர் : _____

11.தற்போது வசிக்கும் வீட்டின் வகை :

1.கூரை வீடு

2.மச்சு வீடு

3.ஓட்டு வீடு

4. கலப்பு வீடு

12. விளையாட விளையாட்டு மைதானத்திற்கு செல்வீர்களா : | ஆம் | இல்லை |

13.தினமும் எத்தனை மணி நேரம் தொலைக்காட்சி பார்ப்பீர்கள் : _____

மாதிரிப் படிவ அடையாள எண் :

14. தினமும் எத்தனை மணி நேரம்

கணினி முன் செலவிடுவீர்கள் : _____

15. பொதுவாக பள்ளிக்கு எவ்வாறு செல்வீர்கள் :

போக்குவரத்து முறை	சரியான கட்டத்தில் குறியிடுக
நடந்து	
சைக்கிள்	
இரு சக்கர வண்டி	
கார்	
பள்ளி பேருந்து	
மற்ற பேருந்து	

மற்றவை குறிப்பிடுக : _____

16. உங்களுக்கு நாட்பட்ட வியாதிகள் உள்ளதா அல்லது அதிக நாள் மருந்துகள் உட்கொண்டு வருகிறீர்களா?

ஆம்	இல்லை

ஆம் என்றால் , குறிப்பிடுக

_____

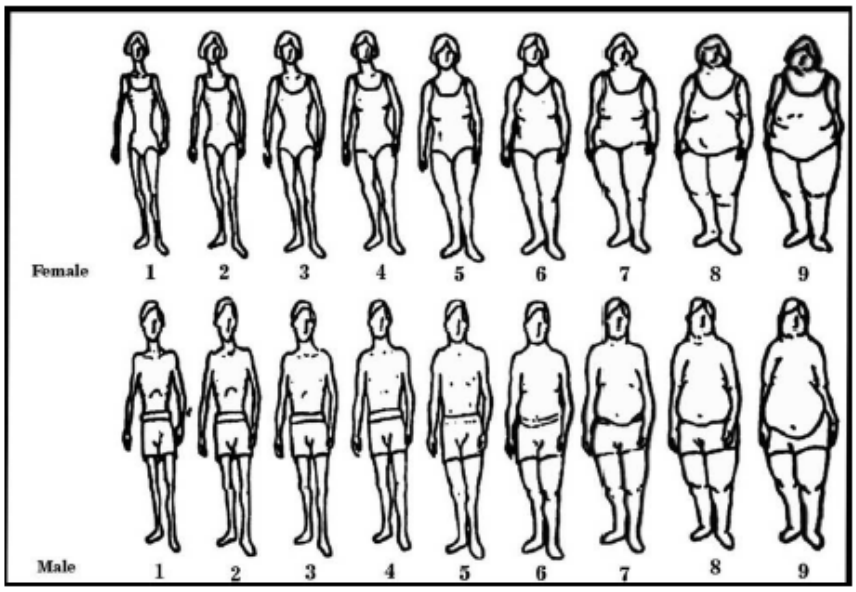
Annexure 7: social networking- English

SOCIAL NETWORKING QUESTIONNAIRE

ID PROFORMA NO:

This questionnaire is being used to understand about your friends and what you do when you meet together. You do not need to identify who your friends are. There is no right or wrong answer.

1. Think of your five closest friends whom you spend most time with. Think carefully about how they look and choose the body image representation that matches their body shape closest.



First alphabet of name of each friend	Write the number in the picture above that closely represents their body image
1.	
2.	
3.	
4.	
5.	

2. Do you eat or snack together outside school.

Yes	
No	

3. If yes, which of them in the following list do you normally eat. There can be more than one answer. Write yes or no in the spaces provided against each item.

Burgers		Coke /Pepsi/soft drink	
Pastries		Pizza	
Puffs		Chips	
Chicken Pakoda		Vada/bajji	

If others, please specify -

4. Do you meet your friends outside the school during leisure time?

Yes	
No	

5. If Yes, what do you do when you meet?

Choose from the answer that represents the most common activity.

Play video games		Sit around and chat	
Eat out		Play outdoor games	
Play indoor games		Others	

If others – Specify _____

6. How do you keep in touch with your friends?

(Choose the option, what you do most of the time)

a) Meet up physically at a common place.

b) facebook/ whats app/ twitter

c) sms/phone calls

d) others specify-_____

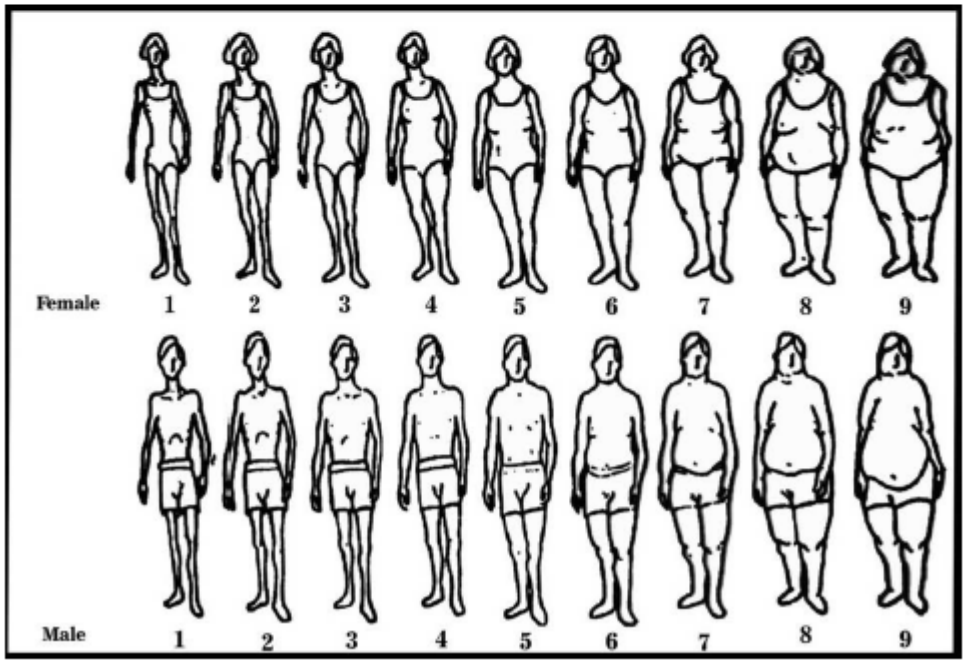
Annexure 8: social networking- Tamil

சமுதாய வலைதளம் பற்றிய கேள்விப்பட்டியல்

மாதிரிப்படிவ அடையாள எண்:

இந்த கேள்விப் பட்டியல் உங்கள் நண்பர்களைப் பற்றியும் நீங்கள் ஒன்றாக சந்திக்கும்போது என்ன செய்வீர்கள் என்பதைப் பற்றியும் புரிந்து கொள்வதற்குப் பயன்படுத்தப்படுகிறது. உங்கள் நண்பர்கள் யார் என்பதை அடையாளம் காட்டவேண்டிய அவசியம் இல்லை. இதில் சரியான விடை அல்லது தவறான விடை என்று எதுவும் இல்லை.

1.நீங்கள் மிக அதிக நேரம் செலவிடும் உங்கள் மிக நெருங்கிய நண்பர்கள் ஐந்து பேரை நினைத்துக்கொள்ளுங்கள். அவர்களது தோற்றம் எவ்வாறு இருக்கும் என்பதை கவனமாக சிந்தித்து கீழ்கண்ட தோற்றங்களுள் அவர்கள் உடல் உருவத்திற்கு ஒப்பான தோற்றத்தைத் தெரிந்தெடுக்கவும்



நண்பருடைய பெயரின் முதல் எழுத்து	மேற்கண்ட படத்தில் அவர்கள் உருவத் தோற்றத்தைக் குறிக்கும் எண்
1.	
2.	
3.	
4.	
5.	

2) நீங்கள் பள்ளிக்கு வெளியே சிற்றுண்டி உண்பீர்களா?

ஆம்	
இல்லை	

3) ஆம் என்றால். கீழ்கண்டவற்றுள் பொதுவாக எவற்றைச் சாப்பிடுவீர்கள்? ஒன்றுக்கும் அதிகமான விடைகள் இருக்கலாம். கீழ்கண்ட பொருட்கள் ஒவ்வொன்றுக்கும் பக்கத்தில் கொடுக்கப்பட்ட இடத்தில் ஆம் அல்லது இல்லை என்று எழுதவும்.

பர்கர்		கோக்/பெப்ஸி/குளிர்பானம்	
பேஸ்டிரி		பீஸா	
பப்ஃஸ்		சிப்ஃஸ்	
சிக்கன் பகோடா		வடை/ப்ஜ்ஜி	

வேறு ஏதேனும் இருந்தால் குறிப்பிடவும் - _____

4) நீங்கள் ஓய்வு நேரத்தில்உங்கள் நண்பர்களை பள்ளிக்கு வெளியே சந்திக்கும் பழக்கம் உண்டா?

ஆம்	
இல்லை	

5) ஆம் என்றால், நீங்கள் சந்திக்கும்போது என்ன செய்வீர்கள்?

கீழ்கண்ட விடைகளுள் நீங்கள் மிக அதிகமாக ஈடுபடும் செயலைத் தெரிந்தெடுக்கவும்.

வீடியோ விளையாட்டுகள் விளையாடுவோம்	
ஒன்றாக உட்கார்ந்து பேசுவோம்	
வெளியே சென்று சாப்பிடுவோம்	
பெரும்பாலும் உள்ளரங்க விளையாட்டுகளை விளையாடுவோம்	
பெரும்பாலும் வெளியரங்க விளையாட்டுகளை விளையாடுவோம்	
வேறு ஏதேனும்	

வேறு ஏதேனும் இருப்பின் குறிப்பிடவும் _____

6) நீங்கள் உங்கள் நண்பர்களை எவ்வாறு தொடர்பு கொள்ளுவீர்கள்?

(நீங்கள் பெரும்பாலும் பயன்படுத்தும் முறையைத் தெரிந்தெடுக்கவும்)

1.நண்பர்களை நேர்முகமாக பொதுவான இடத்தில் சந்தித்தல்

2.ஃபேஸ்பூக் / வாட்ஸ்அப் / ட்விட்டர்

3.தொலைபேசி / ஸ்ம்ஸ் மூலம் தொடர்பு கொள்ளுதல்.

4. மற்றவை குறிப்பிடுக_____

Annexure 9: DASS questionnaire

DASS 21 NAME _____ DATE _____

Please read each statement and circle a number 0, 1, 2 or 3 which indicates how much the statement applied to you over the past week. There are no right or wrong answers. Do not spend too much time on any statement.

The rating scale is as follows:

0 Did not apply to me at all - NEVER

1 Applied to me to some degree, or some of the time - SOMETIMES

2 Applied to me to a considerable degree, or a good part of time - OFTEN

3 Applied to me very much, or most of the time - ALMOST ALWAYS

		N	S	O	AA	FOR OFFICE USE D	A	S
1	I found it hard to wind down	0	1	2	3			
2	I was aware of dryness of my mouth	0	1	2	3			
3	I couldn't seem to experience any positive feeling at all	0	1	2	3			
4	I experienced breathing difficulty (eg, excessively rapid breathing, breathlessness in the absence of physical exertion)	0	1	2	3			
5	I found it difficult to work up the initiative to do things	0	1	2	3			
6	I tended to over-react to situations	0	1	2	3			
7	I experienced trembling (eg, in the hands)	0	1	2	3			
8	I felt that I was using a lot of nervous energy	0	1	2	3			
9	I was worried about situations in which I might panic and make a fool of myself	0	1	2	3			
10	I felt that I had nothing to look forward to	0	1	2	3			
11	I found myself getting agitated	0	1	2	3			
12	I found it difficult to relax	0	1	2	3			
13	I felt down-hearted and blue	0	1	2	3			
14	I was intolerant of anything that kept me from getting on with what I was doing	0	1	2	3			
15	I felt I was close to panic	0	1	2	3			
16	I was unable to become enthusiastic about anything	0	1	2	3			
17	I felt I wasn't worth much as a person	0	1	2	3			
18	I felt that I was rather touchy	0	1	2	3			
19	I was aware of the action of my heart in the absence of physicalexertion (eg, sense of heart rate increase, heart missing a beat)	0	1	2	3			
20	I felt scared without any good reason	0	1	2	3			
21	I felt that life was meaningless	0	1	2	3			
	TOTALS							

DASS Severity Ratings

The DASS is a **quantitative** measure of distress along the 3 axes of depression, anxiety[1] and stress[2]. It is not a categorical measure of clinical diagnoses.

Emotional syndromes like depression and anxiety are intrinsically dimensional - they vary along a continuum of severity (independent of the specific diagnosis). Hence the selection of a single cut-off score to represent clinical severity is necessarily arbitrary. A scale such as the DASS can lead to a useful assessment of **disturbance**, for example individuals who may fall short of a clinical cut-off for a specific diagnosis can be correctly recognised as experiencing considerable symptoms and as being at high risk of further problems.

However for clinical purposes it can be helpful to have 'labels' to characterise degree of severity relative to the population. Thus the following cut-off scores have been developed for defining mild/moderate/severe/ extremely severe scores for each DASS scale.

Note: the severity labels are used to describe the full range of scores in the population, so 'mild' for example means that the person is above the population mean but probably still way below the typical severity of someone seeking help (ie it does not mean a mild level of disorder.

The individual DASS scores do not define appropriate interventions. They should be used in conjunction with all clinical information available to you in determining appropriate treatment for any individual.

[1]Symptoms of psychological arousal
[2]The more cognitive, subjective symptoms of anxiety

DASS 21 SCORE

DEPRESSION SCORE	ANXIETY SCORE	STRESS SCORE

	Depression	Anxiety	Stress
Normal	0 - 4	0 - 3	0 - 7
Mild	5 - 6	4 - 5	8 - 9
Moderate	7 - 10	6 - 7	10 - 12
Severe	11 - 13	8 - 9	13 - 16
Extremely Severe	14 +	10 +	17 +

Annexure 10: DASS questionnaire- Tamil

டாஸ்-21 *(மனச்சோர்வு, பதகளிப்பு, நெருக்கீடு என்பவற்றை மதிப்பிடும் அளவீடு)*

பெயர்:..... திகதி :.....

தயவுசெய்து கீழே தரப்பட்டுள்ள ஒவ்வொரு வாக்கியத்தையும் வாசித்து **கடந்த வாரத்தில்** அது எவ்வள தூரம் உங்களுக்கு பெருத்தமாய் இருந்தது என்பதை காட்டும் வகையில் 0, 1, 2, 3 ஆகிய இலக்கங்களி பொருத்தமானதைச் சுற்றி வட்டமிடவும். இவற்றில் சரி அல்லது பிழையான பதில் என்று எதுவுமில்லை. எந் ஒரு வாக்கியத்திலும் மிக அதிகளவு நேரத்தை செலவிட வேண்டாம்.

மதிப்பீடும் அளவீடு பின்வருமாறு அமையும் :-

0 - ஒரு போதுமே எனக்கு பொருத்தமாக அமையவில்லை - ***ஒருபோதும் இல்லை***

1 - ஓரளவிற்கு அல்லது சில சமயங்களில் எனக்கு பொருத்தமாக இருந்தது - ***சில வேளை***

2 - குறிபிடத்தக்க அளவுக்கு அல்லது அதிகமான வேளைகளில் பொருத்தமாக இருந்தது - ***அடிக்கடி***

3 - எனக்கு அநேகமான வேளைகளில் அல்லது முற்றிலும் பொருத்தமாக இருந்தது - ***அநேகமாக எப்போதும்***

1.	எனக்கு சாதாரண நிலைக்கு மீளுவது கடினமாக இருந்தது.	0	1	2	3
2.	எனது வாய் உலர்ந்திருந்ததை உணரக்கூடியதாக இருந்தது.	0	1	2	3
3.	எனக்கு நல்ல உணர்வு எதனையும் அனுபவிக்க முடியவில்லை.	0	1	2	3
4.	சுவாசிப்பதில் சிரமம் இருப்பதை உணர்ந்தேன். (உ-ம் மிக வேகமான சுவாசம், உடல் களைப்பற்ற நிலையிலும் சுவாசிப்பதற்கு சிரமப்படுதல், அடிக்கடி பெருமூச்சு விடுதல்)	0	1	2	3
5.	எந்த ஒரு விடயத்தையும் தொடங்கிச் செய்வதற்கு உரிய ஊக்கம் இல்லாமலிருந்தது.	0	1	2	3
6.	சில சூழ்நிலைகளில் நான் அளவுக்கு அதிகமாக எதிர் தாக்கம் காட்ட முனைந்தேன்.	0	1	2	3
7.	நடுக்கம் ஏற்படுவதாக உணர்ந்தேன். (உ- ம்: கைகளில்)	0	1	2	3
8.	நான் அதிகளவில் நரம்புச் சக்தியை உபயோகிக்க வேண்டியிருப்பதாக உணர்ந்தேன்.	0	1	2	3
9.	நான் அதிக பீதியடைந்து என்னை நானே ஒரு முட்டாளாக்கிக் கொள்ளக் கூடிய சந்தர்ப்பங்கள் பற்றி கவலைப் பட்டேன்.	0	1	2	3
10.	எனக்கு வாழ்க்கையில் எந்த எதிர்பார்ப்பும் இல்லை என்பது போல உணர்ந்தேன்.	0	1	2	3
11.	நான் கலவரமடைவதாக உணர்ந்தேன்.	0	1	2	3
12.	என்னை தளர்ச்சியடையச் செய்வது கடினமாக இருந்தது.	0	1	2	3
13.	நான் கவலையாகவும் மனமுடைந்து இருப்பதாகவும் உணர்ந்தேன்.	0	1	2	3
14.	நான் செய்கின்ற விடயத்தில் வரும் எந்த ஒரு சிறிய தடையையும் என்னால் பொறுத்துக் கொள்ள முடியாமல் இருந்தது.	0	1	2	3
15.	நான் பீதி நிலையை அண்மித்து விட்டதாக உணர்ந்தேன்.	0	1	2	3
16.	எந்தவொரு விடயத்திலும் எனக்கு ஆர்வமாக ஈடுபட இயலாதிருந்தது.	0	1	2	3
17.	நான் ஒன்றுக்கும் பெறுமதி இல்லாத மனிதனாக உணர்ந்தேன்.	0	1	2	3
18.	நான் இலகுவில் மனதளவில் காயப்படுவதாக உணர்ந்தேன்.	0	1	2	3
19.	உடல் பிரயத்தனமின்றியே என் இதயத்துடிப்பினை உணர்ந்தேன்.(உ-ம் : இதயத்துடிப்பு வேகம் அதிகரிப்பது, ஒரு இதயம் ஒரு துடிப்பை தவற விடுவது போலிருப்பது)	0	1	2	3
20.	பொருத்தமான காரணமெதுவுமின்றி எனக்கு பயம் ஏற்பட்டது.	0	1	2	3
21.	வாழ்க்கை அர்த்தமற்றது என்று உணர்ந்தேன்.	0	1	2	3

Institutional Review Board Clearance

OFFICE OF RESEARCH
INSTITUTIONAL REVIEW BOARD
CHRISTIAN MEDICAL COLLEGE,
BAGAYAM, VELLORE 632002, TAMIL NADU, INDIA

August 27, 2014

Ref: FG/8951/07/2014

Mr. Denzil. S
The Treasurer
Christian Medical College,
Vellore.

Dear Mr. Denzil,

Sub: **Fluid Research Grant Project:**
An assessment of social, psychological and behavioral risk factors for obesity among adolescents who are attending schools in the urban area of Vellore district in Tamil Nadu
Dr. Divya. V. S, PG Registrar, Dr. Jacob John, Community Health, Co-guide:
Dr. Anuradha Rose, Community Health, Dr. Sherab Tsheringla, Child and Adolescent Psychiatry, CMC, Vellore.

Ref: IRB Min. No. 8951 dated 07.07.2014

The Institutional Review Board at its meeting held on July 7th 2014 vide IRB Min. No. **8951** accepted the project for a sum of *16,666/- INR (Rupees Sixteen thousand six hundred sixty six Only) will be granted for 4 months. If overspent the excess should be debited form the respective departmental or Special funds.* Kindly arrange to transfer the sanctioned amount to a separate account to be operated Dr. Divya. V. S and Dr. Jacob John.

Yours sincerely,

Dr. Nihal Thomas
Secretary (Ethics Committee)
Institutional Review Board

Dr. NIHAL THOMAS
MD.,MNAMS.,DNB(Endo),FRACP(Endo),FRCP(Edin),FRCP(Glasg)
SECRETARY - (ETHICS COMMITTEE)
Institutional Review Board,
Christian Medical College, Vellore - 632 002.

CC: Dr. Divya. V. S, Community Health, CMC. Vellore
Dr. Jacob John, Community Health, CMC, Vellore
File

Permission letter from District Educational Officer

//பாதுகாப்பான முறையில்//

வேலூர் மாவட்டக் கல்வி அலுவலர் அவர்களின் செயல்முறைகள்

ந.க.எண்.2371/அ5//2014 நாள். .08.2014.

பொருள் இடைநிலைக் கல்வி – வேலூர் கல்வி மாவட்டத்தில் உள்ள கீழ்காணும் பள்ளியில் சிஎம்சி மருத்துவமனை மூலம் மாணவர்களுக்கான – Community Health –to do a study on obesity among to High school children அனுமதி வழங்குதல்– சார்பு.

பார்வை Vellore District, Department of Health Community Health. CMC. Vellore.

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பார்வையில் கண்ட கடிதத்தில் இக்கல்வி மாவட்டத்தைச் சார்ந்த கீழ்க்கண்ட பள்ளியில் பயிலும் மாணவர்களுக்கு சிஎம்சி மருத்துவர்களால் மருத்துவ முகாம் நடைபெற அனுமதி கோரப்பட்டுள்ளது.

மேற்படி மருத்துவ முகாம் சிறப்பாக நடைபெற மாணவர்கள் மற்றும் ஆசிரியர்கள் மருத்துவர்களுக்கு போதிய ஒத்துழைப்பினை நல்கி, இவ்வாய்ப்பினை பயன்படுத்திக்கொள்ளுமாறு சம்மந்தப்பட்ட பள்ளிதலைமை ஆசிரியர்கள் கேட்டுக்கொள்ளப்படுகிறார்கள்.

பள்ளிகளின் பட்டியல்

1. செயிண்ட் மகளிர் மேல்நிலைப்பள்ளி,
2. இருதய மேல்நிலைப்பள்ளி, ரங்காபுரம்
3. தொன்போஸ்கோ உயர்நிலைப்பள்ளி,
4. ஈவேரா மகளிர் மேல்நிலைப்பள்ளி,வேலூர்.
5. அரசு மேல்நிலைப்பள்ளி, பென்னாத்தூர்.
6. அரசு மேல்நிலைப்பள்ளி, கம்மாவான்பேட்டை
7. அரசு உயர்நிலைப்பள்ளி, இடையஞ்சாத்து.
8. அரசு உயர்நிலைப்பள்ளி, கணியம்பாடி.
9. அரசு உயர்நிலைப்பள்ளி, விருபாட்சிபுரம்.
10. அரசு உயர்நிலைப்பள்ளி,கீழ்அரசம்பட்டு.
11. ரெவபொன்னுரங்கம் உயர்நிலைப்பள்ளி,வேலூர்.
12. ஊரீஸ் மேல்நிலைப்பள்ளி, வேலூர்.

மாவட்டக் கல்வி அலுவலர்
வேலூர்.

13/9/14

பெறுநர்

மேற்கண்ட பள்ளி தலைமை ஆசிரியர்கள்.

நகல். மருத்துவர் வி.எஸ்.திவ்யா, சிஎம்சி,. வேலூர் அவர்களுக்கு தகவலுக்காக அனுப்பலாகிறது.

(2)

//பாதுகாப்பான முறையில்//

வேலூர் மாவட்டக் கல்வி அலுவலர் அவர்களின் செயல்முறைகள்

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பார்வை Vellore District, Department of Health Community Health. CMC. Vellore.

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பார்வையில் கண்ட கடிதத்தில் இக்கல்வி மாவட்டத்தைச் சார்ந்த கீழ்க்கண்ட பள்ளியில் பயிலும் மாணவர்களுக்கு சிஎம்சி மருத்துவர்களால் மருத்துவ முகாம் நடைபெற அனுமதி கோரப்பட்டுள்ளது.

மேற்படி மருத்துவ முகாம் சிறப்பாக நடைபெற மாணவர்கள் மற்றும் ஆசிரியர்கள் மருத்துவர்களுக்கு போதிய ஒத்துழைப்பினை நல்கி, இவ்வாய்ப்பினை பயன்படுத்திக்கொள்ளுமாறு சம்மந்தப்பட்ட பள்ளிதலைமை ஆசிரியர்கள் கேட்டுக்கொள்ளப்படுகிறார்கள்.

பள்ளிகளின் பட்டியல்

1. செயிண்ட் மகளிர் மேல்நிலைப்பள்ளி,
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3. தொன்போஸ்கோ உயர்நிலைப்பள்ளி,
4. ஈவேரா மகளிர் மேல்நிலைப்பள்ளி,வேலூர்.
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9. அரசு உயர்நிலைப்பள்ளி, விருபாட்சிபுரம்.
10. அரசு உயர்நிலைப்பள்ளி,கீழ்அரசம்பட்டு.
11. ரெவபொன்னுரங்கம் உயர்நிலைப்பள்ளி,வேலூர்.
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மாவட்டக் கல்வி அலுவலர்
வேலூர்.

13/9/14

பெறுநர்

மேற்கண்ட பள்ளி தலைமை ஆசிரியர்கள்.

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